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Includes aeronautics (general); aerodynamics; air transportation and safety; aircraft communications and navigation; aircraft design, testing and performance; aircraft instrumentation; aircraft propulsion and power; aircraft stability and control; and research and support facilities (air).

For related information see also *Astronautics*.

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For related information see also *34 Fluid Mechanics and Heat Transfer*.

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VOLUME 23 NUMBER 17 / SEPTEMBER 8, 1985

TABLE OF CONTENTS

AERONAUTICS

Includes aeronautics (general); aerodynamics; air transportation and safety; aircraft communications and navigation; aircraft design, testing and performance; aircraft instrumentation; aircraft propulsion and power; aircraft stability and control; and research and support facilities (air).

For related information see also *Astronautics*.

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02 AERODYNAMICS **2891**

Includes aerodynamics of bodies, combinations, wings, rotors, and control surfaces; and internal flow in ducts and turbomachinery.

For related information see also *34 Fluid Mechanics and Heat Transfer*

03 AIR TRANSPORTATION AND SAFETY **2894**

Includes passenger and cargo air transport operations; and aircraft accidents.

For related information see also *16 Space Transportation* and *85 Urban Technology and Transportation.*

04 AIRCRAFT COMMUNICATIONS AND NAVIGATION **2894**

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For related information see also *17 Spacecraft Communications, Command and Tracking* and *32 Communications.*

05 AIRCRAFT DESIGN, TESTING AND PERFORMANCE **2895**

Includes aircraft simulation technology.

For related information see also *18 Spacecraft Design, Testing and Performance* and *39 Structural Mechanics.*

06 AIRCRAFT INSTRUMENTATION **2897**

Includes cockpit and cabin display devices; and flight instruments.

For related information see also *19 Spacecraft Instrumentation* and *35 Instrumentation and Photography.*

07 AIRCRAFT PROPULSION AND POWER **2897**

Includes prime propulsion systems and systems components, e.g., gas turbine engines and compressors; and on-board auxiliary power plants for aircraft.

For related information see also *20 Spacecraft Propulsion and Power, 28 Propellants and Fuels,* and *44 Energy Production and Conversion.*

08 AIRCRAFT STABILITY AND CONTROL **2899**

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09 RESEARCH AND SUPPORT FACILITIES (AIR) **2905**

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Includes astronautics (general); astrodynamics; ground support systems and facilities (space); launch vehicles and space vehicles; space transportation; spacecraft communications, command and tracking; spacecraft design, testing and performance; spacecraft instrumentation; and spacecraft propulsion and power.

For related information see also *Aeronautics*

12 ASTRONAUTICS (GENERAL) **2907**

For extraterrestrial exploration see *91 Lunar and Planetary Exploration.*

13 ASTRODYNAMICS **N.A.**

Includes powered and free-flight trajectories; and orbit and launching dynamics.

14 GROUND SUPPORT SYSTEMS AND FACILITIES (SPACE) **N.A.**

Includes launch complexes, research and production facilities; ground support equipment, e.g., mobile transporters; and simulators.

For related information see also *09 Research and Support Facilities (Air).*

15 LAUNCH VEHICLES AND SPACE VEHICLES **2908**

Includes boosters; manned orbital laboratories; reusable vehicles; and space stations.

16 SPACE TRANSPORTATION **2908**

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17 SPACECRAFT COMMUNICATION, COMMAND AND TRACKING **N.A.**

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For related information see also *04 Aircraft Communications and Navigation* and *32 Communications.*

18 SPACECRAFT DESIGN, TESTING AND PERFORMANCE **2909**

Includes spacecraft thermal and environmental control; and attitude control.

For life support systems see *54 Man/System Technology and Life Support.* For related information see also *05 Aircraft Design, Testing and Performance* and *39 Structural Mechanics.*

19 SPACECRAFT INSTRUMENTATION **N.A.**

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20 SPACECRAFT PROPULSION AND POWER **2910**

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23 CHEMISTRY AND MATERIALS (GENERAL) 2916
Includes biochemistry and organic chemistry.

24 COMPOSITE MATERIALS 2916
Includes laminates.

25 INORGANIC AND PHYSICAL CHEMISTRY 2917
Includes chemical analysis, e.g., chromatography; combustion theory; electrochemistry; and photochemistry.
For related information see also *77 Thermodynamics and Statistical Physics.*

26 METALLIC MATERIALS 2924
Includes physical, chemical, and mechanical properties of metals, e.g., corrosion; and metallurgy.

27 NONMETALLIC MATERIALS 2933
Includes physical, chemical, and mechanical properties of plastics, elastomers, lubricants, polymers, textiles, adhesives, and ceramic materials.

28 PROPELLANTS AND FUELS 2936
Includes rocket propellants, igniters, and oxidizers; storage and handling; and aircraft fuels.
For related information see also *07 Aircraft Propulsion and Power, 20 Spacecraft Propulsion and Power,* and *44 Energy Production and Conversion.*

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Includes engineering (general); communications; electronics and electrical engineering; fluid mechanics and heat transfer; instrumentation and photography; lasers and masers; mechanical engineering; quality assurance and reliability; and structural mechanics.
For related information see also *Physics.*

31 ENGINEERING (GENERAL) 2938
Includes vacuum technology; control engineering; display engineering; and cryogenics.

32 COMMUNICATIONS 2946
Includes land and global communications; communications theory; and optical communications.
For related information see also *04 Aircraft Communications and Navigation* and *17 Spacecraft Communications, Command and Tracking.*

33 ELECTRONICS AND ELECTRICAL ENGINEERING 2950
Includes test equipment and maintainability; components, e.g., tunnel diodes and transistors; microminiaturization; and integrated circuity.
For related information see also *60 Computer Operations and Hardware* and *76 Solid-State Physics.*

34 FLUID MECHANICS AND HEAT TRANSFER 2957
Includes boundary layers; hydrodynamics; fluidics; mass transfer; and ablation cooling.
For related information see also *02 Aerodynamics* and *77 Thermodynamics and Statistical Physics.*

35 INSTRUMENTATION AND PHOTOGRAPHY 2961
Includes remote sensors; measuring instruments and gages; detectors; cameras and photographic supplies; and holography.
For aerial photography see *43 Earth Resources.* For related information see also *06 Aircraft Instrumentation* and *19 Spacecraft Instrumentation.*

36 LASERS AND MASERS 2970
Includes parametric amplifiers.

37 MECHANICAL ENGINEERING 2972
Includes auxiliary systems (non-power); machine elements and processes; and mechanical equipment.

38 QUALITY ASSURANCE AND RELIABILITY 2975
Includes product sampling procedures and techniques; and quality control.

39 STRUCTURAL MECHANICS 2977
Includes structural element design and weight analysis; fatigue; and thermal stress.
For applications see *05 Aircraft Design, Testing and Performance* and *18 Spacecraft Design, Testing and Performance.*

GEOSCIENCES

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For related information see also *Space Sciences.*

42 GEOSCIENCES (GENERAL) N.A.

43 EARTH RESOURCES 2983
Includes remote sensing of earth resources by aircraft and spacecraft; photogrammetry; and aerial photography.
For instrumentation see *35 Instrumentation and Photography.*

44 ENERGY PRODUCTION AND CONVERSION 2984
Includes specific energy conversion systems, e.g., fuel cells and batteries; global sources of energy; fossil fuels; geophysical conversion; hydroelectric power; and wind power.
For related information see also *07 Aircraft Propulsion and Power, 20 Spacecraft Propulsion and Power, 28 Propellants and Fuels,* and *85 Urban Technology and Transportation.*

45 ENVIRONMENT POLLUTION 2988
Includes air, noise, thermal and water pollution; environment monitoring; and contamination control.

46 GEOPHYSICS 2989
Includes aeronomy; upper and lower atmosphere studies; ionospheric and magnetospheric physics; and geomagnetism.
For space radiation see *93 Space Radiation.*

47 METEOROLOGY AND CLIMATOLOGY 2994
Includes weather forecasting and modification.

48 OCEANOGRAPHY 2997
Includes biological, dynamic and physical oceanography; and marine resources.

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Includes sciences (general); aerospace medicine; behavioral sciences; man/system technology and life support; and planetary biology.

51 LIFE SCIENCES (GENERAL) 2998
Includes genetics.

52 AEROSPACE MEDICINE 2999
Includes physiological factors; biological effects of radiation; and weightlessness.

53 BEHAVIORAL SCIENCES 2999
Includes psychological factors; individual and group behavior; crew training and evaluation; and psychiatric research.

54 MAN/SYSTEM TECHNOLOGY AND LIFE SUPPORT 3002
Includes human engineering; biotechnology; and space suits and protective clothing.

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59 MATHEMATICAL AND COMPUTER SCIENCES (GENERAL) 3003

60 COMPUTER OPERATIONS AND HARDWARE 3007
Includes computer graphics and data processing.
For components see *33 Electronics and Electrical Engineering.*

61 COMPUTER PROGRAMMING AND SOFTWARE 3010
Includes computer programs, routines, and algorithms.

62 COMPUTER SYSTEMS 3015
Includes computer networks.

63 CYBERNETICS 3017
Includes feedback and control theory.
For related information see also *54 Man/System Technology and Life Support.*

64 NUMERICAL ANALYSIS 3017
Includes iteration, difference equations, and numerical approximation.

65 STATISTICS AND PROBABILITY 3024
Includes data sampling and smoothing; Monte Carlo method; and stochastic processes.

66 SYSTEMS ANALYSIS 3025
Includes mathematical modeling; network analysis; and operations research.

67 THEORETICAL MATHEMATICS 3026
Includes topology and number theory.

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Includes physics (general); acoustics; atomic and molecular physics; nuclear and high-energy physics; optics; plasma physics; solid-state physics; and thermodynamics and statistical physics.
For related information see also *Engineering.*

70 PHYSICS (GENERAL) 3026
For geophysics see *46 Geophysics.* For astrophysics see *90 Astrophysics.* For solar physics see *92 Solar Physics.*

71 ACOUSTICS 3027
Includes sound generation, transmission, and attenuation.
For noise pollution see *45 Environment Pollution.*

72 ATOMIC AND MOLECULAR PHYSICS 3028
Includes atomic structure and molecular spectra.

73 NUCLEAR AND HIGH-ENERGY PHYSICS 3035
Includes elementary and nuclear particles; and reactor theory.
For space radiation see *93 Space Radiation.*

74 OPTICS 3036
Includes light phenomena.

75 PLASMA PHYSICS 3038
Includes magnetohydrodynamics and plasma fusion.
For ionospheric plasmas see *46 Geophysics.* For space plasmas see *90 Astrophysics.*

76 SOLID-STATE PHYSICS 3042
Includes superconductivity.
For related information see also *33 Electronics and Electrical Engineering* and *36 Lasers and Masers.*

77 THERMODYNAMICS AND STATISTICAL PHYSICS 3045
Includes quantum mechanics; and Bose and Fermi statistics.
For related information see also *25 Inorganic and Physical Chemistry* and *34 Fluid Mechanics and Heat Transfer.*

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80 SOCIAL SCIENCES (GENERAL) 3046
Includes educational matters.

81 ADMINISTRATION AND MANAGEMENT 3046
Includes management planning and research.

82 DOCUMENTATION AND INFORMATION SCIENCE 3049
Includes information storage and retrieval technology; micrography; and library science.
For computer documentation see *61 Computer Programming and Software.*

83 ECONOMICS AND COST ANALYSIS N.A.
Includes cost effectiveness studies.

84 LAW AND POLITICAL SCIENCE 3051
Includes space law; international law; international cooperation; and patent policy.

85 URBAN TECHNOLOGY AND TRANSPORTATION 3051
Includes applications of space technology to urban problems; technology transfer; technology assessment; and surface and mass transportation.
For related information see *03 Air Transportation and Safety, 16 Space Transportation,* and *44 Energy Production and Conversion.*

SPACE SCIENCES

Includes space sciences (general); astronomy; astrophysics; lunar and planetary exploration; solar physics; and space radiation.
For related information see also *Geosciences.*

88 SPACE SCIENCES (GENERAL) 3052

89 ASTRONOMY 3052
Includes radio and gamma-ray astronomy; celestial mechanics; and astrometry.

90 ASTROPHYSICS 3053
Includes cosmology; and interstellar and interplanetary gases and dust.

91 LUNAR AND PLANETARY EXPLORATION 3054
Includes planetology; and manned and unmanned flights.
For spacecraft design see *18 Spacecraft Design, Testing and Performance.* For space stations see *15 Launch Vehicles and Space Vehicles.*

92 SOLAR PHYSICS 3054
Includes solar activity, solar flares, solar radiation and sunspots.

93 SPACE RADIATION 3055
Includes cosmic radiation; and inner and outer earth's radiation belts.
For biological effects of radiation see *52 Aerospace Medicine.* For theory see *73 Nuclear and High-Energy Physics.*

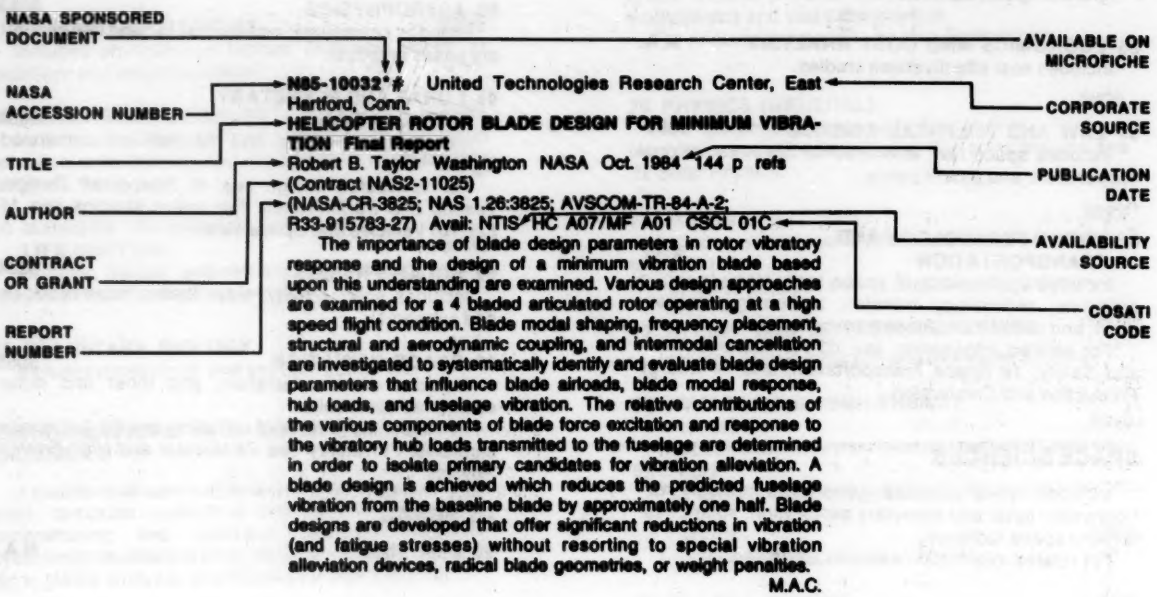
GENERAL

99 GENERAL N.A.

Note: N.A. means that no abstracts were assigned to this category for this issue.

SUBJECT INDEX I-1
PERSONAL AUTHOR INDEX I-61
CORPORATE SOURCE INDEX I-69
CONTRACT NUMBER INDEX I-83
REPORT/ACCESSION NUMBER INDEX I-87

TYPICAL CITATION AND ABSTRACT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N85-10032*# United Technologies Research Center, East Hartford, Conn.
CORPORATE SOURCE
TITLE
HELICOPTER ROTOR BLADE DESIGN FOR MINIMUM VIBRATION Final Report
PUBLICATION DATE
AUTHOR
Robert B. Taylor Washington NASA Oct. 1984 144 p refs
(Contract NAS2-11025)
CONTRACT OR GRANT
(NASA-CR-3825; NAS 1.26:3825; AVSCOM-TR-84-A-2; R33-915783-27) Avail: NTIS HC A07/MF A01 CSCL 01C
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COSATI CODE
The importance of blade design parameters in rotor vibratory response and the design of a minimum vibration blade based upon this understanding are examined. Various design approaches are examined for a 4 bladed articulated rotor operating at a high speed flight condition. Blade modal shaping, frequency placement, structural and aerodynamic coupling, and intermodal cancellation are investigated to systematically identify and evaluate blade design parameters that influence blade airloads, blade modal response, hub loads, and fuselage vibration. The relative contributions of the various components of blade force excitation and response to the vibratory hub loads transmitted to the fuselage are determined in order to isolate primary candidates for vibration alleviation. A blade design is achieved which reduces the predicted fuselage vibration from the baseline blade by approximately one half. Blade designs are developed that offer significant reductions in vibration (and fatigue stresses) without resorting to special vibration alleviation devices, radical blade geometries, or weight penalties.
M.A.C.

VOLUME 23 NUMBER 17 / SEPTEMBER 8, 1985

Scientific and Technical Aerospace Reports

A Semimonthly Publication of the National Aeronautics and Space Administration

01 AERONAUTICS (GENERAL)

N85-27821# Messerschmitt-Boelkow-Blohm G.m.b.H., Munich (West Germany).
[ACTIVITIES IN AEROSPACE] Annual Report, 1983 [KONZERN-GESCHAEFTSBEREICH 1983]
Jun. 1984 45 p In GERMAN Original contains color illustrations
Avail: NTIS HC A03/MF A01

Research concerning helicopters and aircraft, astronautics, transport and passenger aircraft, and military techniques is summarized. Author (ESA)

02 AERODYNAMICS

Includes aerodynamics of bodies, combinations, wings, rotors, and control surfaces; and internal flow in ducts and turbomachinery.

For related information see also *34 Fluid Mechanics and Heat Transfer.*

N85-27822*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
SUPERSONIC AERODYNAMIC CHARACTERISTICS OF CANARD, TAILLESS, AND AFT-TAIL CONFIGURATIONS FOR 2 WING PLANFORMS
Peter F. Covell Jun. 1985 69 p refs
(NASA-TP-2434; L-15927; NAS 1.60:2434) Avail: NTIS HC A04/MF A01 CSCL 01A

Aerodynamic characteristics of canard, tailless, and aft tail configurations were compared in tests on a general research model (generic fuselage without canopy, inlets, or vertical tails) at Mach 1.60 and 2.00 in the Langley Unitary Plan Wind Tunnel. Two uncambered wing planforms (trapezoidal with 44 deg leading edge sweep and delta with 60 deg leading edge sweep) were tested for each configuration. The relative merits of the configurations were also determined theoretically, to evaluate the capabilities of a linear theory code for such analyses. The canard and aft tail configurations have similar measured values for lift curve slope, maximum lift drag ratio, and zero lift drag. The stability decrease as Mach number increases is greatest for the tailless configuration and least for the canard configuration. Because of very limited accuracy in predicting the aerodynamic parameter increments between configurations, the linear theory code is not adequate for determining the relative merits of canard, tailless, and aft tail configurations. Author

N85-27823*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
STATIC AND DYNAMIC PRESSURE MEASUREMENTS ON A NACA 0012 AIRFOIL IN THE AMES HIGH REYNOLDS NUMBER FACILITY
John B. McDevitt and Arthur F. Okuno Jun. 1985 78 p refs
(NASA-TP-2485; A-85100; NAS 1.60:2485) Avail: NTIS HC A05/MF A01 CSCL 02A

The supercritical flows at high subsonic speeds over a NACA 0012 airfoil were studied to acquire aerodynamic data suitable for evaluating numerical-flow codes. The measurements consisted primarily of static and dynamic pressures on the airfoil and test-channel walls. Shadowgraphs were also taken of the flow field near the airfoil. The tests were performed at free-stream Mach numbers from approximately 0.7 to 0.8, at angles of attack sufficient to include the onset of buffet, and at Reynolds numbers from 1 million to 14 million. A test action was designed specifically to obtain two-dimensional airfoil data with a minimum of wall interference effects. Boundary-layer suction panels were used to minimize sidewall interference effects. Flexible upper and lower walls allow test-channel area-ruling to nullify Mach number changes induced by the mass removal, to correct for longitudinal boundary-layer growth, and to provide contouring compatible with the streamlines of the model in free air. E.A.K.

N85-27824*# Scientific Research Associates, Inc., Glastonbury, Conn.
USERS MANUAL FOR COORDINATE GENERATION CODE CRDSRA
S. J. Shamroth Jun. 1985 17 p refs
(Contract NAS1-15214)
(NASA-CR-172584; NAS 1.26:172584) Avail: NTIS HC A02/MF A01 CSCL 01A

Generation of a viable coordinate system represents an important component of an isolated airfoil Navier-Stokes calculation. The manual describes a computer code for generation of such a coordinate system. The coordinate system is a general nonorthogonal one in which high resolution normal to the airfoil is obtained in the vicinity of the airfoil surface, and high resolution along the airfoil surface is obtained in the vicinity of the airfoil leading edge. The method of generation is a constructive technique which leads to a C type coordinate grid. The method of construction as well as input and output definitions are contained herein. The computer code itself as well as a sample output is being submitted to COSMIC. Author

N85-27825*# Scientific Research Associates, Inc., Glastonbury, Conn.
USER'S MANUAL FOR AIRFOIL FLOW FIELD COMPUTER CODE SRAIR
Stephen J. Shamroth Jun. 1985 60 p refs
(Contract NAS1-15214)
(NASA-CR-172585; NAS 1.26:172585) Avail: NTIS HC A04/MF A01 CSCL 01A

A two dimensional unsteady Navier-Stokes calculation procedure with specific application to the isolated airfoil problem is presented. The procedure solves the full, ensemble averaged Navier-Stokes equations with turbulence represented by a mixing length model. The equations are solved in a general nonorthogonal coordinate system which is obtained via an external source. Specific Cartesian locations of grid points are required as input for this

code. The method of solution is based upon the Briley-McDonald LBI procedure. The manual discusses the analysis, flow of the program, control steam, input and output. Author

N85-27826# Cranfield Inst. of Tech., Bedford (England). Coll. of Aeronautics.
SOME EFFECTS OF SWEEP DIRECTION AND STRAKES FOR WINGS WITH SHARP LEADING EDGES
D. I. A. Poll and Cheng-Hao Qiu (Peking Inst. of Aeronautics and Astronautics) May 1984 33 p refs
(CA-8421; ISBN-0-947767-088) Avail: NTIS HC A03/MF A01

An experimental investigation has been carried out to compare the effects of sweep direction upon the aerodynamic characteristics of three wing planforms, each with sharp leading edges. The wings have biconvex aerofoil sections which allow them to be tested in both the forward-swept and backward-swept configurations without changing the section profile. Measurements of lift, drag and pitching moment have been made for angles of incidence in the range -5 deg to +50 deg at a mean chord Reynolds number of approximately 1.5 x 10 to the 5th power and Mach number of 0.1. To complement the force and moment data a comprehensive series of oil-flow visualizations are also presented. In addition the aerodynamic characteristics of simple strakes (wing root fillets) have been studied for both the swept-forward and swept-back configurations. Author

N85-27827# Cranfield Inst. of Tech., Bedford (England). Aerodynamics Div.
ON THE EFFECT OF WING TAPER AND SWEEP DIRECTION ON LEADING EDGE TRANSITION
D. I. A. Poll and D. J. Paisley Dec. 1984 25 p refs
(CA-8435; ISBN-0-947767-096) Avail: NTIS HC A02/MF A01

An experimental study has been made of the conditions necessary to produce transition in a swept attachment-line boundary layer which is subjected to disturbances from trip wires of various sizes. The boundary layer considered is that formed on a long tapered cylinder which has been tested in both the backward swept and forward swept configurations. Results from these tests are compared with previous work on an untapered model. Some important similarities and some puzzling differences have been found. Finally, consideration is given to the practical implications of this work. It is suggested that a forward swept wing may be capable of supporting a laminar attachment-line flow at a much higher free-stream Reynolds number than a corresponding swept back wing. Author

N85-27828*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
NUMERICAL STUDY OF POROUS AIRFOILS IN TRANSONIC FLOW
Chung-Lung Chen (Colorado Univ., Boulder), Chen-Yen Chow (Colorado Univ., Boulder), Terry L. Holst, and William R. VanDalsem May 1985 23 p refs
(NASA-TM-86713; Rept-85209; NAS 1.15:86713) Avail: NTIS HC A02/MF A01 CSCL 01A

A numerical study was made to examine the effect of a porous surface on the aerodynamic performance of a transonic airfoil. The pressure jump across the normal shock wave on the upper surface of the airfoil was reduced by making the surface below the shock porous. The weakened shock is preceded by an oblique shock at the upstream end of the porous surface where air is blown out of the cavity. The lambda shock structure shown in the numerical result qualitatively agrees with that observed in the wind tunnel. According to the present analysis, the porous airfoil has a smaller drag and a higher lift than the solid airfoil. Author

N85-27829# National Aeronautical Establishment, Ottawa (Ontario).
AN INTRODUCTION TO VORTEX BREAKDOWN AND VORTEX CORE BURSTING
J. L. Hall Mar. 1985 29 p refs
(NAE-AN-28; NRC-24336) Avail: NTIS HC A03/MF A01

The phenomenon of vortex breakdown, also known as vortex core bursting is introduced. The first part of the report presents some important elements of basic vortex theory. The second part reviews the research that was done on vortex breakdown. An overview of the historical development of vortex breakdown research and a summary of the current state of knowledge on the subject are also included. Author

N85-27830# National Aeronautical Establishment, Ottawa (Ontario).
WING TUNNEL INVESTIGATION OF DYNAMIC STALL OF AN NACA 0018 AIRFOIL OSCILLATING IN PITCH
R. H. Wickens Feb. 1985 71 p refs
(NAE-AN-27; NRC-24262) Avail: NTIS HC A04/MF A01

This report presents aerodynamic data on an NACA 0018 airfoil oscillating in pitch in the NAE 2m X 3m Low Speed Tunnel. The purpose of the test was to simulate the dynamic aerodynamic behavior of a Vertical Axis Wind Turbine blade section at the equatorial plane under the dynamic stall conditions which may occur at low ratios of tip speed to wind speed. Measurements were made of wing surface pressure time histories at various chordwise locations, during a complete cycle of oscillation. The dynamic effects on nose suction pressures were seen to increase their magnitude and to delay flow breakdown to a higher angle of attack. Integration of wing pressures furnished normal and chordwise forces during the angle of attack cycle. The behavior of these parameters showed that dynamic stall for wing angles of attack up to 30 degrees, occurred about 5 degrees later than for the equivalent steady flow case. This phenomenon resulted in an increase in normal force of about 20% and an increase in chordwise force of about 40% when the wing is pitching to 30 degrees. Author

N85-27831# Naval Postgraduate School, Monterey, Calif.
A METHOD TO CALCULATE THE PARAMETERS OF WINGS OF ARBITRARY PLANFORM M.S. Thesis
E. M. Barber Dec. 1984 42 p
(AD-A152689) Avail: NTIS HC A03/MF A01 CSCL 20/4

The computation method developed in this thesis proceeds from the theory developed by Jones (Ref. 1). His final equations are first rewritten in matrix format. They are then organized into computational sequences that must be translated into computer programming language to calculate the aerodynamic parameters of wings of arbitrary planform. GRA

N85-27832# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
AERODYNAMIC PERFORMANCE OF A WING IN GROUND EFFECT USING THE PANAIR PROGRAM M.S. Thesis
A. R. Goetz Dec. 1984 68 p
(AD-A153303; AFIT/GAE/AA/84D-7) Avail: NTIS HC A04/MF A01 CSCL 20/4

The primary objective of this thesis is to correlate computed theoretical data with experimental data for wings in ground effect. This investigation uses the PANAIR computer program--a higher-order panel method to predict the lift and drag characteristics of an aspect ratio two wing, with and without endplates, operating at low speed in ground effect. The effects of altitude, trailing edge flap deflection and angle of attack are considered. Numerical results are compared with subsonic wind tunnel experimental data. For both the numerical and experimental methods, the image model technique is used to simulate ground effect. Excellent agreement between numerical results and experimental data is achieved for the wing without endplates down to low (approximately 10% of wing chord) altitudes. For the wing with endplates, numerical results are in good agreement with experimental data for altitudes greater than approximately 20% of the wing chord. PANAIR results diverged from experimental data at lower altitudes because the model did not attempt to account for spanwise flow between the bottom of the endplate and the ground, and other viscous effects which tend to become dominant. These include a static pressure increase beneath the wing and wake distortions behind the configuration. GRA

N85-27833# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Brunswick (West Germany). Abt. Zellenaerodynamik.

DESIGN OF A BASIC PROFILE FOR A LOW SWEEP AIRFOIL. PART 2: EXPERIMENTAL INVESTIGATION ON THE DFVLR-W1 AIRFOIL PROFILE IN THE BRUNSWICK TRANSONIC WIND TUNNEL

Georg Wichmann 1985 62 p refs In GERMAN; ENGLISH summary Report will also be announced as translation (ESA-TT-917)

(DFVLR-FB-85-01-Pt-2; ISSN-0171-1342) Avail: NTIS HC A04/MF A01; DFVLR, Cologne DM 19.50

The airfoil DFVLR-W1 was investigated in a transonic wind tunnel at free transition in the Mach number range between 0.5 and 0.81, at a Reynolds number 6 million. The influence of different locations of transition fixing was investigated. Results are presented as aerodynamic coefficients, airfoil performance boundaries, and pressure distributions. It is shown that the design requirements are met by the airfoil. A comparison with theoretical results indicates the applicability of the computer codes used in the design process. Author (ESA)

N85-27834# Technische Hogeschool, Delft (Netherlands). Dept. of Mathematics and Informatics.

UPWIND-DIFFERENCE METHODS FOR AERODYNAMIC PROBLEMS GOVERNED BY THE EULER EQUATIONS

Bram vanLeer 1984 18 p refs Presented at 15th AMS/SIAM Summer Seminar on Large-Scale Computations in Fluid Mech., La Jolla, Calif., 27 Jun. - 8 Jul. 1983

(Rept-84-23) Avail: NTIS HC A02/MF A01

Upwind-difference schemes for the solution of the steady Euler equations are interpreted as projection-evolution schemes, with a numerical stage (interpolation of discrete initial values) and a physical stage (computation of fluxes). The schemes are compared with a central-difference scheme, stabilized by explicit dissipation. Upwind schemes are more robust, but take longer. Author (ESA)

N85-27835# Technische Hogeschool, Delft (Netherlands). Dept. of Aerospace Engineering.

TRANSONIC MACH NUMBER DETERMINATION IN A BLOW-DOWN WIND TUNNEL WITH SOLID WALLS AND A DOWN-STREAM THROAT

W. J. Bannink and P. G. Bakker Oct. 1983 34 p

(VTH-LR-402) Avail: NTIS HC A03/MF A01

Calibration measurements of the transonic flow in a wind tunnel (test section: 28 cm x 25.3 cm) with solid walls are described. Along the tunnel center line the static pressure distribution was measured, with and without a model in the test section. Using the static pressure distributions, the distribution of the ratio of the effective sonic cross-sectional area was determined. Far upstream of the model (> 14 chord lengths) the ratio is constant, meaning that no influence of the model is felt there. In that region reference positions in the tunnel side wall, where the pressures can be used to determine the free stream Mach number of the tunnel flow, were chosen. Author (ESA)

N85-27836# National Aerospace Lab., Amsterdam (Netherlands).

AERODYNAMIC RESEARCH IN PREPARATION FOR A NEW DUTCH TRANSPORT AIRCRAFT WITH SUPERCRITICAL WINGS

1983 13 p In DUTCH; ENGLISH summary Sponsored by Netherlands Agency for Aerospace Programs

(B8580077) Avail: NTIS HC A02/MF A01

An aerodynamic design procedure for a supercritical wing, based on the viewpoint that the pressure distribution determines its characteristics more then the geometry is developed. In the absence of a computer program for the calculation of three-dimensional transonic flow, a procedure is applied in which it is assumed that the difference between the transonic and the subsonic pressure distribution around a two-dimensional airfoil determines the same relation around the three dimensional wing. In order to limit the number of solutions, weight factors are applied in the calculations. In an iterative process to find a geometry satisfying the geometrical constraint, a video terminal coupled to a CYBER-72 computer is utilized. Wind-tunnel experiments prove that the design procedure yields satisfactory results. Author (ESA)

N85-27837# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Goettingen (West Germany). Abteilung Instationaere Aerodynamik.

ANALYSIS OF UNSTEADY PRESSURE MEASUREMENTS ON A SUPERCRITICAL AIRFOIL WITH A HARMONICALLY OSCILLATING TRAILING EDGE FLAP AT SUBSONIC AND TRANSONIC SPEEDS

H. Sundara Murthy (National Aeronautical Lab., Bangalore, India) Jul. 1984 79 p refs In GERMAN; ENGLISH summary Sponsored by German Academic Exchange Service (DAD)

(DFVLR-FB-84-49; ISSN-0171-1342) Avail: NTIS HC A05/MF A01; DFVLR, Cologne DM 26.50

Unsteady pressure distributions measured in a transonic wind tunnel on a supercritical airfoil of 13% maximum thickness with an oscillating trailing edge flap were analyzed. The influences of oscillation frequency, flap mean deflection, and incidence on the unsteady pressure distribution are discussed in the Mach number range of 0.3 to 0.85; the effects of the oscillation amplitude at M = 0.78 are also analyzed. Unsteady lift and moment coefficients obtained from unsteady pressure distributions are discussed. Author (ESA)

N85-27838# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Goettingen (West Germany). Inst. fuer Theoretische Stroemungsmechanik.

METHODS FOR DESIGN AERODYNAMICS OF MODERN TRANSPORT AIRCRAFT

Helmut Sobieczky Dec. 1984 74 p refs In GERMAN; ENGLISH summary Report will also be announced as translation (ESA-TT-923)

(DFVLR-FB-85-05; ISSN-0171-1342) Avail: NTIS HC A04/MF A01; DFVLR, Cologne DM 23

A concept to obtain shock-free transonic flow for design aerodynamics of aircraft and turbomachinery is outlined. The method of elliptic continuation or method of fictitious gas represents a starting point for operational computational procedures to obtain supercritical airfoils and wings. Design examples illustrate the value of shock-free configurations for aerodynamic efficiency enhancement. The application of supercritical flow in aerodynamic concepts is mentioned. Author (ESA)

N85-28155# Joint Publications Research Service, Arlington, Va.

CHARACTERISTICS OF STEADY-STATE HYPERSONIC FLOW ABOUT BLUNTED BODIES WITH DISCONTINUITIES IN GENERATORS Abstract Only

V. D. Serova *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-85-004) 15 May 1985 p 80-81 Transl. into ENGLISH from Vestn. Leningr. Univ.: Mat. Mekhan. Astron. (Leningrad), v. 13, no. 3, Jun. 1984 p 80-85 (For primary document see N85-28142 17-31)

Avail: NTIS HC A06/MF A01

N85-28158# Joint Publications Research Service, Arlington, Va.

SUPERSONIC FLOW AROUND BLUNT WEDGE Abstract Only

S. V. Manuylovich *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-85-004) 15 May 1985 p 82 Transl. into ENGLISH from Izv. Akad. Nauk SSSR: Mekhan. Zhidkosti i Gaza (Moscow), no. 4, Jul. - Aug. 1984 p 137-140 (For primary document see N85-28142 17-31)

Avail: NTIS HC A06/MF A01

N85-28161# Joint Publications Research Service, Arlington, Va.

METHOD OF CALCULATING SEPARATION FLOW OF SUBSONIC GAS STREAM AROUND WINGS Abstract Only

S. M. Belotserkovskiy, V. N. Korzhnev, and S. D. Shipilov *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-85-004) 15 May 1985 p 84 Transl. into ENGLISH from Izv. Akad. Nauk SSSR: Mekhan. Zhidkosti i Gaza (Moscow), no. 4, Jul. - Aug. 1984

p 141-147 (For primary document see N85-28142 17-31)
Avail: NTIS HC A06/MF A01

N85-28162# Joint Publications Research Service, Arlington, Va.
SUPERSONIC FLOW AROUND WEAK RADIATION SOURCES Abstract Only
K. V. Krasnobayev *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-85-004) 15 May 1985 p 85 Transl. into ENGLISH from Izv. Akad. Nauk SSSR: Mekhan. Zhidkosti i Gaza (Moscow), no. 4, Jul. - Aug. 1984 p 133-136 (For primary document see N85-28142 17-31)
Avail: NTIS HC A06/MF A01

03 AIR TRANSPORTATION AND SAFETY

Includes passenger and cargo air transport operations; and aircraft accidents.

For related information see also *16 Space Transportation* and *85 Urban Technology and Transportation.*

N85-27839*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
ICE SHAPES AND THE RESULTING DRAG INCREASE FOR A NACA 0012 AIRFOIL
William Olsen, Robert Shaw, and James Newton 12 Jan. 1984 31 p refs Presented at the 22nd Aerospace Sci. Meeting, Reno, Nev., 9-12 Jan. 1984; sponsored by AIAA
(NASA-TM-83556; E-1935; NAS 1.15:83556) Avail: NTIS HC A03/MF A01 CSCL 01C

Experimental measurements of the ice shapes and resulting drag increases were measured in the NASA-Lewis Icing Research Tunnel. The measurements were made over a large range of conditions (e.g., airspeed and temperature, drop size and liquid water content of the cloud, and the angle of attack of the airfoil). The measured drag increase did not agree with the existing correlation. Additional results were given which are helpful in understanding the ice structure and the way it forms, and in improving the ice accretion modeling theories. There are data on the ice surface roughness, on the effect of the ice shape on the local droplet catch, and on the relative importance of various parts of the ice shape on the drag increase. Experimental repeatability is also discussed. Auhor

N85-27840# Rotterdam Aviation Association (Netherlands).
ROTTERDAM AIRPORT AND THE COMMON MARKET
May 1984 32 p ref
Avail: NTIS HC A03/MF A01

The possibilities offered to airline companies to operate within the European Economic Community from Rotterdam airport, in light of Community directive 83/416/EEC, are presented. The routes must be within the Community, be at least 400 km long (except where natural barriers make air travel necessary), and use aircraft weighing < 30 tons at takeoff, carrying up to 70 passengers plus freight. Author (ESA)

N85-27841 Joint Publications Research Service, Arlington, Va.
USSR REPORT: TRANSPORTATION
29 Aug. 1984 44 p Transl. into ENGLISH from various Russian articles
(JPRS-UTR-84-025) Copyright. Avail: NTIS HC A03

This U.S.S.R. report presents research and development data in the area of transportation. The test flight of IL-76TD long-range transport variant is reported. For individual titles, see N85-27842 through N85-27842.

N85-27842 Joint Publications Research Service, Arlington, Va.
TEST FLIGHT OF IL-76TD LONG-RANGE TRANSPORT VARIANT
V. Belikov *In its* USSR Rept.: Transportation (JPRS-UTR-84-025) 29 Aug. 1984 p 1-3 Transl. into ENGLISH from Izvestiya (Moscow), 21 May 1984 p 1 (For primary document see N85-27841 17-03)
Avail: NTIS HC A03

The unique uses of the IL-76TD long-range Transport Variant are addressed. Flight characteristics that contribute to the efficiency of the IL-76TD cargo aircraft are discussed. Flight tests carried out under emergency conditions are reported. B.W.

04 AIRCRAFT COMMUNICATIONS AND NAVIGATION

Includes digital and voice communication with aircraft; air navigation systems (satellite and ground based); and air traffic control.

For related information see also *17 Spacecraft Communications, Command, and Tracking* and *32 Communications.*

N85-27843*# Textron Bell Helicopter, Fort Worth, Tex.
INVESTIGATION OF IMAGING AND FLIGHT GUIDANCE CONCEPTS FOR ROTORCRAFT ZERO VISIBILITY APPROACH AND LANDING
W. L. McKeown Aug. 1984 172 p refs
(Contract NAS2-11364)
(NASA-CR-166571; T-3771; NAS 1.26:166571) Avail: NTIS HC A08/MF A01 CSCL 17G

A simulation experiment to explore the use of an augmented pictorial display to approach and land a helicopter in zero visibility conditions was conducted in a fixed base simulator. A literature search was also conducted to determine related work. A display was developed and pilot in-the-loop evaluations were conducted. The pictorial display was a simulated, high resolution radar image, augmented with various parameters to improve distance and motion cues. Approaches and landings were accomplished, but with higher workloads and less accuracy than necessary for a practical system. Recommendations are provided for display improvements and a follow on simulation study in a moving based simulator. Author

N85-27844# Federal Aviation Administration, Washington, D.C.
NATIONAL AIRSPACE REVIEW, CHANGE 1 Interim Report
Jan. 1985 119 p Supersedes AD-A147768
(AD-A152369; AD-E900434) Avail: NTIS HC A06/MF A01 CSCL 17/7

Since the summer of 1982, the Federal Aviation Administration (FAA) has been hosting task group working sessions of the National Airspace Review (NAR). The NAR is a cooperative venture by the aviation industry and government. The NAR is comprehensively reviewing current air traffic controller procedures, flight regulations, and airspace for the purpose of validating the current system or identifying near-term changes which will promote greater efficiency. As a component of the National Airspace System Plan, the NAR will provide the operational framework for moving into the next generation National Airspace System (NAS). In the area of procedures, task groups have covered: terminal services, weather programs, traffic flow management, helicopter operations, separation standards and the National Flight Data System. GRA

N85-27845# Naval Postgraduate School, Monterey, Calif.
REAL-TIME POSITION DETERMINATIONS USING THE GPS TI4100/GEOSTAR RECEIVER M.S. Thesis
P. J. Rakowsky Sep. 1984 81 p
(AD-A152551) Avail: NTIS HC A05/MF A01 CSCL 17/7

The NAVSTAR Global Positioning System is a worldwide, all-weather, satellite positioning system capable of high accuracy real-time position determinations. The Applied Research Laboratories (ARL:UT), in conjunction with the Naval Surface Weapons Center (NSWC/DL) and other government agencies, conducted geodetic field tests of a government sponsored prototype receiver, the TI4100/GEOSTAR, in March 1984. Data were acquired from four satellites by three receivers, with antennas located at known stations, over approximately six-hour periods each day. Based on real-time solutions acquired on March 1, 6, and 9, 1984, absolute

point position determinations have an average discrepancy of 7.5 meters with a one sigma repeatability of less than a meter. Relative positions were determined to an average relative accuracy of 1:9,700 for distances of 14 to 26 kilometers. GRA

N85-27846# Army Test and Evaluation Command, Aberdeen Proving Ground, Md.
DISTANCE MEASURING EQUIPMENT (DME), GENERAL Final Test Operations Procedure
15 Mar. 1985 20 p Supersedes MTP-6-2-075
(AD-A152585; TOP-6-2-075; MTP-6-2-075) Avail: NTIS HC A02/MF A01 CSCL 17/7

A series of engineering tests designed to determine the technical performance of distance measuring systems and equipment is outlined in this test operation procedure (TOP). The only type of DME system treated in this TOP is the VOR/TACAN/DME. The following tests collectively constitute an engineering evaluation of DME to determine: (1) Range and Accuracy - The average inbound lock-on and outboard unlock range limits and frequency distribution of errors within the range limits; (2) Warmup - The time required for the test item to become operational after activation; (3) Influence of Weather - The effects of selected meteorological conditions on the performance of the test item.
Author (GRA)

N85-27847# National Aerospace Lab., Amsterdam (Netherlands). Hoofdafd. Vliegtuigen.
FLYING IN SPITE OF THE WEATHER
F. J. Abbink 3 Aug. 1984 85 p refs In DUTCH; ENGLISH summary Presented at Neth. Assoc. for Aeron. Eng. Symp. on Aviation Meteorol., Delft, 13 Apr. 1984
(NLR-MP-84021-U; B8560217) Avail: NTIS HC A05/MF A01

The impact of weather on aircraft design, propulsion, avionics and on board equipment, and on air traffic control is surveyed. Flight hazards in different weather conditions are described in relation to impact on flight safety and operation costs.
Author (ESA)

N85-27848# National Aerospace Lab., Amsterdam (Netherlands). Afd. Vliegtuigen.
DEVELOPMENTS IN THE AREA OF AIR TRAFFIC CONTROL SYSTEMS AND THE RELATION WITH METEOROLOGY
T. H. M. Hagenberg Mar. 1984 27 p refs In DUTCH; ENGLISH summary Presented at Neth. Assoc. for Aeron. Eng. Symp. on Aviation Meteorol., Delft, 13 Apr. 1984
(NLR-MP-84029-U) Avail: NTIS HC A03/MF A01

Avionic systems such as secondary surveillance radar and microwave landing systems potential for further automation in air traffic control systems are discussed. The organization of air traffic services and the relation of these services with meteorology are outlined.
Author (ESA)

N85-27849# National Aerospace Lab., Amsterdam (Netherlands).
A SYSTEM FOR TAKE-OFF AND LANDING MEASUREMENTS (STALINS)
1983 12 p In DUTCH; ENGLISH summary Sponsored by Netherlands Agency for Aerospace Programs
(B8580072) Avail: NTIS HC A02/MF A01

A high accuracy inertial system for measuring the flight path during takeoff and landing was developed to create independence from airfield equipment. Using a Litton LTN-58 inertial system, a RASP antenna, and a data processing computer program, an accuracy of 2 m in X and Y directions and 0.15 m in altitude is obtained.
Author (ESA)

N85-27850# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Brunswick (West Germany). Abteilung Kreiselgeraete und Traegheitsnavigation.
SIMULATION OF GYROCOMPASSING ALIGNMENT AND CALIBRATION OF STRAPDOWN INERTIAL NAVIGATION SYSTEM IN A SWAYING VEHICLE
Shipin Ye (Chinese Aeronautical Establishment) and Bernhard Stieler Oct. 1984 102 p refs In GERMAN; ENGLISH summary (DFVLR-Mitt-84-20; ISSN-0176-7739) Avail: NTIS HC A06/MF A01; DFVLR, Cologne DM 34

The philosophy of strapdown inertial navigation system (SDS) alignment and calibration using a gyrocompassing and north leveling loop was investigated by numerical simulations. It was assumed that the SDS is mounted in a swaying vehicle with varying initial conditions and dynamic parameters. The simulation concentrated on the selection of the pole distribution for the gyrocompassing and north leveling loops, and the choice of the loop parameters, the speeding up of the alignment and calibration process by letting the loop gains vary with time, and the calibration of the system gyro drifts in a single, two and three position of the inertial measuring unit with respect to true north. Alignment accuracy is best for the three position calibration.
Author (ESA)

N85-28295# National Bureau of Standards, Boulder, Colo. Time and Frequency Div.
SEPARATING THE VARIANCES OF NOISE COMPONENTS IN THE GLOBAL POSITIONING SYSTEM
D. W. Allan and M. Weiss *In* NRL Proc. of the 15th Ann. Precise Time and Time Interval (PTTI) Appl. and Planning Meeting 2 Apr. 1984 p 115-131 (For primary document see N85-28287 17-35)
(AD-P004578) Avail: NTIS HC A99/MF E03 CSCL 14/2

05 AIRCRAFT DESIGN, TESTING AND PERFORMANCE

Includes aircraft simulation technology.
For related information see also *18 Spacecraft Design, Testing and Performance* and *39 Structural Mechanics.*

N85-27851 Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany).
DEVELOPMENT OF A FUSELAGE FORWARD SECTION IN CARBON FIBER REINFORCED PLASTIC (CFRP) TYPE OF CONSTRUCTION [ENTWICKLUNG EINES RUMPFVORDERTEILES IN CFK-BAUWEISE]
M. Voglsinger Oct. 1984 44 p In GERMAN
(MBB/LFA34/CFK/PUB/008) Copyright. Avail: Issuing Activity

A complete fuselage nose made of CFRP was developed and manufactured. Cost and time constraints imposed compromises, such as testing at room temperature without humidity and no buckling loading up to rupture. The main goals of the experimental program are nevertheless achieved and the suitability of this type of construction is demonstrated. A CFRP portion of 50% is shown to be a sensible upper limit; a sufficient static strength is obtained; a mass reduction of 18% can be obtained; the reproducibility of the production method is demonstrated; and the higher CFRP material and equipment costs are shown to be compensated by a reduced assembly cost.
Author (ESA)

N85-27852*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
FRICTION AND WEAR BEHAVIOR OF ALUMINUM AND COMPOSITE I-BEAM STIFFENED AIRPLANE SKINS
Karen E. Jackson Jun. 1985 28 p refs Prepared in cooperation with Army Structures Lab., Hampton, Va.
(NASA-TM-86418; NAS 1.15:86418; USAAVSCOM-TM-85-B-2) Avail: NTIS HC A03/MF A01 CSCL 01C

Friction and wear behavior was determined for I-beam stiffened skins constructed of aluminum, graphite-epoxy composite, and glass hybrid composite under abrasive loading conditions typical of those occurring on the underside of a transport airplane during an emergency belly landing. A test apparatus was developed to abrade the test specimens on actual runway surface under a range of pressures (2-5 psi) and velocities (16-50 mph). These parameters were chosen to fall within the range of conditions typical of an airframe sliding on a runway surface. The effects of the test variables on the wear rate and the coefficient of friction are discussed and comparisons are made between the composite materials and aluminum. In addition, the test apparatus was

equipped to monitor the temperature variations on the backside of the skins during abrasion and these results are presented.
Author

N85-27853# Cranfield Inst. of Tech., Bedford (England). Coll. of Aeronautics.
AN ASSESSMENT OF THE SUITABILITY OF THE BHGA STRUCTURAL TEST RIG FOR AERODYNAMIC TESTING OF HANG GLIDERS
E. A. Kilkenny Feb. 1985 29 p refs
(CA-8505; ISBN-0-947767-185) Avail: NTIS HC A03/MF A01

In response to a proposal by the BHGA to use their structural test rig to carry out aerodynamic testing of hang gliders, the existing structural test facility and the modifications already made for aerodynamic testing are described. Improvements to the instrumentation are discussed together with an assessment of the flow quality and recommendations made, based on experience gained from existing aerodynamic test facilities. Author

N85-27854*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
ROTORCRAFT RESEARCH TESTING IN THE NATIONAL FULL-SCALE AERODYNAMICS COMPLEX AT NASA AMES RESEARCH CENTER
William Warmbrodt, Charles A. Smith, and Wayne Johnson May 1985 90 p refs
(NASA-TM-86687; Rept-85140; NAS 1.15:86687) Avail: NTIS HC A05/MF A01 CSCL 01C

The unique capabilities of the National Full-Scale Aerodynamics Complex (NFAC) for testing rotorcraft systems are described. The test facilities include the 40- by 80-Foot Wind Tunnel, the 80- by 120-Foot Wind Tunnel, and the Outdoor Aerodynamic Research Facility. The Ames 7- by 10-Foot Subsonic Wind Tunnel is also used in support of the rotor research programs conducted in the NFAC. Detailed descriptions of each of the facilities, with an emphasis on helicopter rotor test capability, are presented. The special purpose rotor test equipment used in conducting helicopter research is reviewed. Test rigs to operate full-scale helicopter main rotors, helicopter tail rotors, and tilting prop-rotors are available, as well as full-scale and small-scale rotor systems for use in various research programs. The test procedures used in conducting rotor experiments are discussed together with representative data obtained from previous test programs. Specific examples are given for rotor performance, loads, acoustics, system interactions, dynamic and aeroelastic stability, and advanced technology and prototype demonstration models. B.W.

N85-27855*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
ADDITION OF FLEXIBLE BODY OPTION TO THE TOLA COMPUTER PROGRAM, PART 1 Final Report
J. W. Dick and B. J. Benda Oct. 1975 402 p refs 2 Vol.
(Contract NAS1-13259)
(NASA-CR-132732-1; NAS 1.26:132732-1) Avail: NTIS HC A18/MF A01 CSCL 01C

This report describes a flexible body option that was developed and added to the Takeoff and Landing Analysis (TOLA) computer program. The addition of the flexible body option to TOLA allows it to be used to study essentially any conventional type airplane in the ground operating environment. It provides the capability to predict the total motion of selected points on the analytical methods incorporated in the program and operating instructions for the option are described. A program listing is included along with several example problems to aid in interpretation of the operating instructions and to illustrate program usage. Author

N85-27856*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
ADDITION OF FLEXIBLE BODY OPTION TO THE TOLA COMPUTER PROGRAM. PART 2: USER AND PROGRAMMER DOCUMENTATION
J. W. Dick and B. J. Benda Oct. 1975 205 p refs 2 Vol.
(Contract NAS1-13259)
(NASA-CR-132732-2; NAS 1.26:132732-2) Avail: NTIS HC A10/MF A01 CSCL 01C

User and programmer oriented documentation for the flexible body option of the Takeoff and Landing Analysis (TOLA) computer program are provided. The user information provides sufficient knowledge of the development and use of the option to enable the engineering user to successfully operate the modified program and understand the results. The programmer's information describes the option structure and logic enabling a programmer to make major revisions to this part of the TOLA computer program.
Author

N85-27857# National Research Council of Canada, Ottawa (Ontario).
A PRELIMINARY INVESTIGATION OF HANDLING QUALITIES REQUIREMENTS FOR HELICOPTER INSTRUMENT FLIGHT DURING DECELERATING APPROACH MANEUVERS AND OVERSHOOT
S. Kekeliuk and M. Morgan Feb. 1985 35 p refs
(NRC-24173; NAE-AN-26) Avail: NTIS HC A03/MF A01

A preliminary flight investigation was carried out to highlight deficiencies of helicopters handling qualities when performing low speed instrument approaches. Steep decelerating microwave landing system approaches to a decision height of 50 feet, simultaneously decelerating to 20 knots, were performed in the NAE Airborne Simulator, a variable-stability Bell 205A helicopter. Tracking performance, in terms of height, azimuth and speed errors was of an acceptable standard, but pilot workload was extremely high, especially during the overshoot phase. Benefits of different levels of control system augmentation were not readily apparent in this high workload environment. A follow-on program is proposed where further attempts will be made to determine the effects of display and control sophistication on pilot workload during slow speed helicopter instrument procedures. Author

N85-27858# Dayton Univ., Ohio. Research Inst.
USAF DAMAGE TOLERANT DESIGN HANDBOOK: GUIDELINES FOR THE ANALYSIS AND DESIGN OF DAMAGE TOLERANT AIRCRAFT STRUCTURES, REVISION B Final Report, Sep. 1980 - Mar. 1984
J. P. Gallagher, F. J. Giessler, and A. P. Berens Wright-Patterson AFB, Ohio AFWAL May 1984 1329 p
(Contract F33615-80-C-3229)
(AD-A153161; AFWAL-TR-82-3073-REV-B) Avail: NTIS HC A99/MF E05 CSCL 01/3

This handbook supports the USAF Airplane Damage Tolerance Requirements contained in MIL-A-83444. The handbook provides specific background data and justification for the detailed requirements of MIL-A-83444 and provides guidelines and state-of-the-art analysis methods to assist contractor and USAF personnel in complying with the intent of the specification and in solving cracking problems, in general, for metallic aircraft structures. The material contained in this document is general enough to be useful in the evaluation of the damage tolerance of in-service aircraft designed and qualified prior to the issuance of MIL-A-83444. The handbook has been structured to provide a clear and concise summary of the specification, MIL-A-83444, as well as supporting analysis methods, test techniques, and nondestructive inspection (NDI) methods are provided as state-of-the-art along with suggested and/or recommended practices, limitations, etc. For the convenience of the user, copies of appropriate USAF structural specifications are contained as an appendix to this handbook.
GRA

N85-27859# Aeronautical Research Labs., Melbourne (Australia).
FLIGHT TRIALS OF A MODIFIED GULFSTREAM COMMANDER CARRYING EXTERNAL STORES
P. A. Farrell and A. Goldman Sep. 1984 27 p
(AD-A153376; ARL/STRUC-TM-392) Avail: NTIS HC A03/MF A01 CSCL 01/3

The Dept. of Aviation Australia has modified a gulfstream G.695A aircraft to carry external stores on the fuselage. A vibration test followed by a series of flight trails were conducted to satisfy

some of the requirements of certification. A description of these tests together with the results is given. GRA

N85-27860# National Aerospace Lab., Amsterdam (Netherlands). Flight Div.
PARAMETER IDENTIFICATION RESULTS OF TESTS IN NON-STEADY SYMMETRIC FLIGHT WITH THE HAWKER HUNTER Mk 7
J. H. Breeman 4 Jan. 1983 59 p refs
(Contract NIVR-1697)
(NLR-TR-83042-U; B8560426) Avail: NTIS HC A04/MF A01

A flight test method for high speed aircraft was evaluated in nonsteady symmetric maneuvers with the Hawker Hunter Mk 7. The reproducibility of the estimated parameters is 1.5% for the drag model, 1% for the lift model, and 3% for the pitching moment model. However, this last result is strongly affected by the uncertainty in the center of gravity location. The results agree with findings derived from the same data after allowing for a difference in the mean aerodynamic chord used in the latter results. The results are consistent with flight tests of a Hawker Hunter Mk 12. Author (ESA)

N85-27861# National Aerospace Lab., Amsterdam (Netherlands).
NEW MATERIALS AND TECHNIQUES FOR AIRCRAFT STRUCTURES
1983 15 p In DUTCH; ENGLISH summary Sponsored by Netherlands Agency for Aerospace Programs
(B8580074) Avail: NTIS HC A02/MF A01

The structural static strength and stiffness, fatigue crack propagation resistance, residual strength, stress corrosion resistance, and fracture toughness of aircraft construction materials and the techniques to produce them are discussed. Aluminum alloys (Al Zn Mg Cu, Al Cu Mg), fiber (carbon, boron, keular) composite materials, titanium alloys, high strength steels, and adhesively bonded laminated sheet structures are discussed. Author (ESA)

N85-27862# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Oberpfaffenhofen (West Germany). Inst. fuer Physik der Atmosphaere.
THREE POWERED SAILPLANES AS METEOROLOGICAL INSTRUMENTATION FOR ATMOSPHERIC BOUNDARY LAYER STUDIES AT DFVLR
Anne M. Joachum, Manfred E. Reinhardt, and Hermann Willeke Nov. 1984 151 p refs In GERMAN; ENGLISH summary Report will also be announced as translation (ESA-TT-920) Original contains color illustrations
(DFVLR-FB-84-50; ISSN-0171-1342) Avail: NTIS HC A08/MF A01

Three ASK 16 powered sailplanes are used as meteorological research aircraft for atmospheric boundary layer studies. The instrumentation and the data acquisition and evaluation systems as well as an error analysis are described. Data and results are presented. Author (ESA)

06 AIRCRAFT INSTRUMENTATION

Includes cockpit and cabin display devices; and flight instruments.

For related information see also *19 Spacecraft Instrumentation* and *35 Instrumentation and Photography.*

N85-27863# Applied Systems Inst., Inc., Washington, D.C.
AVIONICS DATA BASE Final Report
J. McGowan, D. J. Won, and D. VamEtten Jan. 1985 272 p
(AD-A152415; FAA-APO-85-4) Avail: NTIS HC A12/MF A01 CSCL 09/2

This document is a compendium of data for U.S. commercial avionics equipment produced by 61 manufacturers. It contains data for the Air Transport Association (ATA) Specification 100 categories of auto flight, communications, indicating and recording, and navigation as well as for antennas and couplers. For each piece of equipment, the following information has been collected: technical specification, price, technical standard order number, ATA Specification 100 code, and manufacturer name, address, and phone number. In addition to this report, the data is available in machine readable form compatible with the IBM personal computer with R base 4000 Data Base Management System. GRA

N85-27864# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Brunswick (West Germany). Abteilung Navigation und Flugbahnvermessung.
THE AVIONICS FLIGHT EVALUATION SYSTEM (AFES) OF DFVLR
Karlheinz Hurrass and Peter Schulz 1985 83 p refs In GERMAN; ENGLISH summary
(DFVLR-Mitt-85-01; ISSN-0176-7739) Avail: NTIS HC A05/MF A01

An Avionics Flight Evaluation System (AFES) was developed, particularly for navigation systems. A tracking radar and a laser tracker on the ground, and an inertial navigation system onboard the test aircraft measure flight trajectories. The data are combined by optimal filters. In order to be able to evaluate in real time, computers are used at different locations. All elements of this measurement system are linked together by an efficient data transfer system. Besides the reference system, AFES contains subsystems for artificial traffic loading and measuring multipath effects. Author (ESA)

07 AIRCRAFT PROPULSION AND POWER

Includes prime propulsion systems and systems components, e.g., gas turbine engines and compressors; and on-board auxiliary power plants for aircraft.

For related information see also *20 Spacecraft Propulsion and Power, 28 Propellants and Fuels,* and *44 Energy Production and Conversion.*

N85-27865 Department of the Air Force, Washington, D.C.
SEGMENTED ZONED FUEL INJECTION SYSTEM FOR USE WITH A COMBUSTOR Patent
G. W. Moore and R. G. Carroll, inventors (to Air Force) Issued 19 Feb. 1985 6 p
(AD-D011640; US-Patent-4,499,735; US-Patent-Appl-SN-578304; US-Patent-Class-60-739) Avail: US Patent and Trademark Office CSCL 21/5

A segmented, zoned fuel injection system for use within the entrance area of a combustor is described. The fuel injection system has a plurality of spray bars formed as part of closely-spaced apart segments. The spray bars are zoned to permit additional control of profile and flow rate of fuel injected into the combustor. This design permits radial profile control within the combustor, maintains higher efficiency at low fuel flows and easy replacement and/or maintenance of the components thereof. GRA

N85-27866 Department of the Air Force, Washington, D.C.
SPACER STRUCTURE Patent
G. Webb, inventor (to Air Force) Issued 19 Feb. 1985 7 p Supersedes AD-D008756
(AD-D011641; US-Patent-4,500,255; US-Patent-Appl-SN-256880; US-Patent-Class-415-189) Avail: US Patent and Trademark Office CSCL 21/5

A structure useable as a spacer is described. In a preferred embodiment, the spacer is ideally suited (one of a plurality of identical spacers) for use as a spacer between every two adjacent stator vanes of a stator vane ring of a multiplestage fan of a gas turbofan engine. The spacer is in the form of a rectangular solid and comprises a metal face skin member having a curved aerodynamically configurated outer surface with a centrally-located longitudinally-positioned concavity which functions as a rib, and a backing pad member that is made of a molded polyethelene material with integral peripheral edge lip seals that are coated

with a polyurethane material, and that is joined by its outer surface to the inner surface of the face skin member, with the backing pad member having an embeddded rib skin stiffner positioned under, along, and in contact with the concavity in the face skin member. In the adaptation as a fan stator vane spacer, each spacer is releasably attached by novel means to the fan stator vane ring in the space on the ring between every two adjavent fan stator vanes, and is positioned in the force-to-aft fan air flow such that the fan air flows over the curved aerodynamically configured outer surface of the face skin member in the direction of the longitudinally-positioned concavity. In this adaptation, the spacer proides peripheral sealing, ice impact resistance, and face skin stability, and prevents or at least minimizes fan air flow short circuits around vane ends and beneath the spacer. GRA

N85-27867*# Oklahoma State Univ., Stillwater. School of Mechanics and Aerospace Engineering.
PREDICTIONS AND MEASUREMENTS OF ISOTHERMAL FLOWFIELDS IN AXISYMMETRIC COMBUSTOR GEOMETRIES Ph.D. Thesis. Final Report
D. L. Rhodes and D. G. Lilley May 1985 169 p refs
(Grant NAG3-74)
(NASA-CR-174916; NAS 1.26:174916) Avail: NTIS HC A08/MF A01 CSCL 21E

Numerical predictions, flow visualization experiments and time-mean velocity measurements were obtained for six basic nonreacting flowfields (with inlet swirl vane angles of 0 (swirler removed), 45 and 70 degrees and sidewall expansion angles of 90 and 45 degrees) in an idealized axisymmetric combustor geometry. A flowfield prediction computer program was developed which solves appropriate finite difference equations including a conventional two equation k-epsilon eddy viscosity turbulence model. The wall functions employed were derived from previous swirling flow measurements, and the stairstep approximation was employed to represent the sloping wall at the inlet to the test chamber. Recirculation region boundaries have been sketched from the entire flow visualization photograph collection. Tufts, smoke, and neutrally buoyant helium filled soap bubbles were employed as flow tracers. A five hole pitot probe was utilized to measure the axial, radial, and swirl time mean velocity components. Author

N85-27868*# Ohio State Univ., Columbus. Dept. of Engineering Mechanics.
A STUDY OF INTERNAL AND DISTRIBUTED DAMPING FOR VIBRATING TURBOMACHINER BLADES Final Report, 15 Apr. 1983 - 15 Apr. 1985
Arthur W. Leissa Jun. 1985 24 p refs
(Grant NAG3-424)
(NASA-CR-175901; NAS 1.26:175901) Avail: NTIS HC A02/MF A01 CSCL 21E

Internal and distributed damping as possible methods for reducing the vibration response of turbomachine blades and theoretical methods for analyzing damped vibration were studied. It is demonstrated how the Ritz-Galerkin methods may be used to straightforwardly to analyze forced vibrations with damping. This is done directly without requiring the free vibration eigenfunctions. The Galerkin method is an effective technique for these types of problems. The Ritz method has the further advantage of not needing to satisfy the force type boundary conditions, which is particularly important for plates and shells. But proper functionals representing the forcing and damping terms must be developed, and this is done. Two types of damping--viscous and material (hysteretic) are considered. Both distributed and concentrated exciting forces are treated. Numerical results are obtained for cantilevered beams and rectangular plates. Studies showing the rates of convergence of the solutions are made. In the case of the cantilever beam, approximate solutions from the present methods are compared with the exact solutions. R.J.F.

N85-27869*# Princeton Univ., N. J. Dept. of Mechanical and Aerospace Engineering.
THE ROLE OF SURFACE GENERATED RADICALS IN CATALYTIC COMBUSTION Final Report
D. A. Santavicca, Y. Stein, and B. S. H. Royce Jun. 1985 24 p refs
(Grant NAG3-353)
Avail: NTIS HC A02/MF A01 CSCL 21B

Experiments were conducted to better understand the role of catalytic surface reactions in determining the ignition characteristics of practical catalytic combustors. Hydrocarbon concentrations, carbon monoxide and carbon dioxide concentrations, hydroxyl radical concentrations, and gas temperature were measured at the exit of a platinum coated, stacked plate, catalytic combustor during the ignition of lean propane-air mixtures. The substrate temperature profile was also measured during the ignition transient. Ignition was initiated by suddenly turning on the fuel and the time to reach steady state was of the order of 10 minutes. The gas phase reaction, showed no pronounced effect due to the catalytic surface reactions, except the absence of a hydroxyl radical overshoot. It is found that the transient ignition measurements are valuable in understanding the steady state performance characteristics. E.A.K.

N85-27870*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
FUTURE FUNDAMENTAL COMBUSTION RESEARCH FOR AEROPROPULSION SYSTEMS
Edward J. Mularz 1985 8 p refs Presented at the 21st Joint Propulsion Conf., Monterey, Calif.; sponsored by AIAA, SAE, ASME and ASEE
(NASA-TM-87049; E-2612; NAS 1.15:87049; AIAA-85-1398; USAAVSCOM-TR-85-C-11) Avail: NTIS HC A02/MF A01 CSCL 21E

Physical fluid mechanics, heat transfer, and chemical kinetic processes which occur in the combustion chamber of aeropropulsion systems were investigated. With the component requirements becoming more severe for future engines, the current design methodology needs the new tools to obtain the optimum configuration in a reasonable design and development cycle. Research efforts in the last few years were encouraging but to achieve these benefits research is required into the fundamental aerothermodynamic processes of combustion. It is recommended that research continues in the areas of flame stabilization, combustor aerodynamics, heat transfer, multiphase flow and atomization, turbulent reacting flows, and chemical kinetics. Associated with each of these engineering sciences is the need for research into computational methods to accurately describe and predict these complex physical processes. Research needs in each of these areas are highlighted. E.A.K.

N85-27871# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
INVESTIGATION OF HEAT TRANSFER TO A TURBINE BLADE CASCADE USING A SHOCK TUBE M.S. Thesis
J. E. Gochenaur Dec. 1984 107 p
(AD-A153090; AFIT/GAE/AA/84D-6) Avail: NTIS HC A06/MF A01 CSCL 21/5

In order to increase the turbine inlet temperatures at which gas turbine engines operate it is important to understand the heat transfer mechanisms which govern turbine blade heating. This study used a shock tube to generate high temperature gas flows which were allowed to pass through a turbine blade cascade. A Germanium surface thermocouple was used to provide temperature historics at five locations on a turbine blade for a range of flow temperature to blade temperature ratios. Heat transfer rates were determined from these temperature histories using a finite differencing scheme to approximate the heat equation. It was found that the rate of heat transfer along the pressure side of the blade decreased with chordwise position from a maximum value at the leading edge. On the blade suction side, heat transfer rates were found to be considerably greater at the 1/4 and 1/2 chord positions than at the leading edge. GRA

N85-27872# National Aerospace Lab., Amsterdam (Netherlands).
FAN NOISE SUPPRESSION IN TURBOFAN ENGINES
1983 13 p In DUTCH; ENGLISH summary Sponsored by

Netherlands Agency for Aerospace Programs
(B8580076) Avail: NTIS HC A02/MF A01

The optimum impedance of the sound absorbing materials of the intake and exhaust ducts of turbofan engines is investigated. To detect the circumferential modes, measurements were performed in a mode simulator in which spiraling sound waves can be generated or suppressed using a ring of loudspeakers in the wall. A computer program to calculate the sound absorbtion of sound absorbing material lined ducts together with the sound radiated on the ground was developed. The acoustic impedance of a Helmholtz-resonator type liner is determined using a two-microphone technique in which the amplitude and phase inside and on the resonator are measured. Author (ESA)

N85-27873# National Aerospace Lab., Amsterdam (Netherlands).
TESTING OF MATERIALS AND COATINGS FOR JET ENGINE COMPONENTS UNDER SIMULATED OPERATIONAL CONDITIONS
1983 14 p In DUTCH; ENGLISH summary Sponsored by Netherlands Agency for Aerospace Programs Original contains color illustrations
(B8580073) Avail: NTIS HC A02/MF A01

Two installations were built to test turbine blades, vanes, and compresscr components under simulated polluted-air operational conditions. A burner rig controlled by a process computer was constructed to test the thermal fatigue of turbine blades and vanes at high temperatures. A compressor, and a combustion and mixing chamber were constructed to simulate the conditions under which the compressor components operate. Results show that most materials need a special coating when used in the Western European atmosphere. Author (ESA)

N85-27874# SIGRI Electrogradhit G.m.b.H., Meitingen (West Germany).
REACTION-BONDED AND FIBER-REINFORCED SiC STATIC AND DYNAMIC GAS TURBINE COMPONENTS Final Report, Jun. 1983
Wolfgang Heider, Horst Boeder, and Hermann Ferber Bonn Bundesministerium fuer Forschung und Technologie Dec. 1984 90 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie.
(BMFT-FB-T-84-302; ISSN-0340-7608) Avail: NTIS HC A05/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 19.50

The development, manufacturing, and testing of static gas turbine components in reaction sintered silicon impregnated silicon carbide (SiSiC) and the application of carbon fiber reinforced silicon carbide (CSiC) in dynamically loaded components were studied for the development of a ceramic gas turbine for high process temperatures. The SiSiC can be applied for static high temperature turbine components and CSiC with a long oxidation stability for dynamically loaded components. Line production of complex-shaped turbine components is based on the improvement of the injection molding technique and on the production of combustion chambers and of a turbine entrance spiral. Author (ESA)

N85-28147# Joint Publications Research Service, Arlington, Va.
VIBRATIONS OF ROTORS CONNECTED THROUGH COUPLINGS WITH BACKLASH Abstract Only
E. L. Poznyak and G. P. Mayorov *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-85-004) 15 May 1985 p 19-20 Transl. into ENGLISH from Mashinostr. (Moscow), no. 5, Sep. - Oct. 1984 p 36-42 (For primary document see N85-28142 17-31)
Avail: NTIS HC A06/MF A01

N85-28148# Joint Publications Research Service, Arlington, Va.
PRECISION DIE FORGING OF BLADES OR GAS TURBINES Abstract Only
E. G. Shastin *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-85-004) 15 May 1985 p 27 Transl. into ENGLISH from Energomashinostr. (Moscow), no. 8, Aug. 1984 p 20-22 (For primary document see N85-28142 17-31)
Avail: NTIS HC A06/MF A01

N85-28149# Joint Publications Research Service, Arlington, Va.
STRESSED-STRAINED STATE OF TIGHTENING BUCKLES IN SECTIONAL RUNNERS OF GAS TURBINES Abstract Only
I. K. Bakumenko and N. A. Kulakovskaya *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-85-004) 15 May 1985 p 27-28 Transl. into ENGLISH from Energomashinostr. (Moscow), no. 9, Sep. 1984 p 7-10 (For primary document see N85-28142 17-31)
Avail: NTIS HC A06/MF A01

08 AIRCRAFT STABILITY AND CONTROL

Includes aircraft handling qualities; piloting; flight controls; and autopilots.

N85-27875# Air Force Wright Aeronautical Labs., Wright-Patterson AFB, Ohio.
USE OF QUATERNIONS IN FLIGHT MECHANICS Final Technical Report, Jul. 1982 - Sep. 1983
W. L. Hankey, L. E. Miller, and S. J. Scherr Mar. 1984 48 p
(AF Proj. 2307)
(AD-A152616; AFWAL-TR-84-3045) Avail: NTIS HC A03/MF A01 CSCL 12/1

In analyzing aircraft spin and other flight maneuvers with large rotation rates based upon first principles, the non-linear aerodynamic equations (Navier-Stokes) must be coupled with the rigid-body dynamic equations of motion. In both systems of equations it is desirable to use a body axes system to describe the forces and moments, and utilize a surface-oriented coordinate system for obtaining the flowfield grid. To solve this system of equations it is necessary to describe the position of the aircraft with respect to a fixed inertial coordinate system. The classic method is to use the Euler angles to define the aircraft orientation. However, singularities and ambiguities exist when the elevation angle is plus or minus ninety degrees. This difficulty has been overcome in the field of inertial guidance by the use of quaternions to describe the aircraft position in space. It is the purpose of this report to investigate this technique for numerically solving aircraft spin problems. Two problems are addressed; the first is a nonsymmetric body and the second is a symmetric configuration. The rotational dynamics and the solution for the quaternions and Euler angles are determined for both problems. Hamilton (circa 1840) was the first to point out that the three Euler angles are inadequate to uniquely define the orientation of a body in space and that four variables are required to resolve the predicament. Hence he invented the quaternion which is a scalar plus a vector, totalling four elements. GRA

N85-27876# Naval Postgraduate School, Monterey, Calif.
ANALYSIS OF CONTROL SYSTEM FROM A VIEWPOINT OF DESIRED POLE PLACEMENT AND DESIRED DEGREE OF ROBUSTNESS M.S. Thesis
J. Chang Dec. 1984 83 p
(AD-A152627) Avail: NTIS HC A05/MF A01 CSCL 12/1

A design method for solving the problem of robustness to cross-coupling perturbations in multivariable control systems for the X22A V/STOL aircraft is presented in this thesis. The method uses numerical optimization procedures to manipulate the system feedback gains as direct design variables. The manipulation is accomplished in a manner that produces desired performance by pole placement and robustness by modification of the minimum singular values of the system return difference matrix. Channels affected by cross-coupling perturbation may be recognized by the character of their transfer function Bode plots. The mechanism used by the pole placement and robustness routine in obtaining a robust design is evident from the gain changes associated with the transfer function diagram and the zero shifts shown on pole-zero plots. The pole placement and robustness routine uses gain equalization and zero assignment to modify the characteristics of the system in the areas of low singular values, producing a robust design. GRA

N85-27877# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.

DESIGN OF ROBUST CONTROLLERS FOR A MULTIPLE INPUT-MULTIPLE OUTPUT CONTROL SYSTEM WITH UNCERTAIN PARAMETERS APPLICATION TO THE LATERAL AND LONGITUDINAL MODES OF THE KC-135 TRANSPORT AIRCRAFT M.S. Thesis

H. H. Russell Dec. 1984 380 p

(AD-A153100; AFIT/GE/ENG/84D-72) Avail: NTIS HC A17/MF A01 CSCL 01/4

A multiple input-multiple output flight control design on the KC-135 aircraft is completed using Quantitative Feedback Theory (QFT). The three degrees-of-freedom model for the lateral mode is reduced to a two degrees-of-freedom model. From this model a robust controller is developed to perform two maneuvers over a wide range of the aircraft flight envelope. The three degrees-of-freedom for the longitudinal mode is then used to develop a robust controller to perform one maneuver. The first and second body bending modes are then added to remove the rigid bosy constraint and a robust control is developed for the non-rigid aircraft. The robust controllers developed for the lateral and longitudinal modes are simulated over a large range of the aircraft's flight envelope. The conclusion drawn from the research is that this method is very effective in designing multiple input-multiple output systems with plant uncertainty. GRA

N85-27878# McDonnell Aircraft Co., St. Louis, Mo.

CONTROLLER REQUIREMENTS FOR UNCOUPLED AIRCRAFT MOTION, VOLUME 1 Final Report, Aug. 1981 - Apr. 1984

K. D. Citurs Wright-Patterson AFB, Ohio AFWAL Sep. 1984 198 p

(Contract F33615-81-C-3605)

(AD-A153173; AFWAL-TR-84-3060-Vol-1) Avail: NTIS HC A09/MF A01 CSCL 01/1

Use of uncoupled, six-degree-of-freedom (6-DOF) motion is rapidly becoming state-of-the-art in terms of necessary flight control laws and aerodynamic capability. The next generation of aircraft may use uncoupled, 6-DOF control capability in conjunction with other new technologies. In order for future applications of 6-DOF control to be successful, the pilot must be able to command motion and acceleration magnitudes with sufficiently good system response characteristics to accomplish particular missions or tasks. This study sought to develop design criteria and gather appropriate substantiating data for cockpit control devices for 6-DOF motion which will assure compatibility among the pilot, control device(s) and aircraft response and thus allow efficient implementation of the 6-DOF control capability. Phase 1 consisted of defining existing data on the design of cockpit controllers for 6-DOF motion. Application of 6-DOF aircraft motion to aircraft mission requirements was examined. A set of tentative criteria was formulated and test plans developed to gather data necessary to validate and expand the tentative criteria. A simulation was conducted using the motion based simulator at Wright-Patterson AFB. Results of the simulation were combined with the results of the literature survey to form a set of design guidelines. Volume 1 presents the results of the literature survey, summarizes the simulation effort and presents the design criteria. GRA

N85-27879# McDonnell Aircraft Co., St. Louis, Mo.

CONTROLLER REQUIREMENTS FOR UNCOUPLED AIRCRAFT MOTION, VOLUME 2 Final Report, Aug. 1981 - Apr. 1984

K. D. Citurs Wright-Patterson AFB, Ohio AFWAL Sep. 1984 558 p

(Contract F33615-81-C-3605)

(AD-A153300; AFWAL-TR-84-3060-Vol-2) Avail: NTIS HC A24/MF A01 CSCL 01/4

Use of uncoupled, six-degree-of-freedom (6-DOF) motion is rapidly becoming state-of-the-art in terms of necessary flight control laws and aerodynamic capability. The next generation of aircraft may use uncoupled, 6-DOF control capability in conjunction with other new technologies such as Integrated Flight-Fire Control (IFFC). In order for future applications of 6-DOF control to be successful, the pilot must be able to command motion and acceleration magnitude with sufficiently good system response characteristics to accomplish particular missions or tasks. This study sought to develop design criteria and gather appropriate substantiating data for cockpit control devices for 6-DOF motion which will assure compatibility among the pilot, control device(s) and aircraft response and thus allow efficient implementation of the 6-DOF control capability. Phase 1 consisted of defining existing data on the design of of cockpit controllers for 6-DOF. Application of 6-DOF aircraft motion to aircraft mission requirements was examined. A set of tentative criteria was formulated and test plans developed to gather data necessary to validate and expand the tentative criteria. A simulation was conducted using the motion-based simulator at Wright-Patterson AFB. Results of the simulation were combined with results of the literature survey to form a set of design guidelines. Volume 1 (AD-A153300) presents the results of the literature survey. Volume 2 is a detailed discussion of the simulation and analysis of the data. GRA

N85-27880# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Brunswick (West Germany). Abteilung Flaechenflugzeuge.

IN-FLIGHT INVESTIGATION OF THE INFLUENCE OF PITCH DAMPING AND PITCH CONTROL EFFECTIVENESS ON LANDING APPROACH FLYING QUALITIES OF STATICALLY UNSTABLE TRANSPORT AIRCRAFT

Knut Wilhelm and Dieter Schafranek Feb. 1984 66 p refs

(DFVLR-FB-84-12) Avail: NTIS HC A04/MF A01; DFVLR, Cologne DM 26

A in-flight simulator was used to investigate the flying qualities of statically unstable transport aircraft. The numerical values of pitch damping and pitch control effectiveness were varied in combination with a constant amount of instability. Over 70 landing approaches were flown by 3 pilots evaluating 5 configurations. Pilot ratings on the basis of the Cooper-Harper scale and a special effort rating scale and statistical values of measured performance data are presented. Decreasing the pitch damping in combination with an unchanged amount of instability leads to unacceptable flying qualities due to extreme difficulties with pitch attitude tracking. High values of pitch control effectiveness make the aircraft oversensitive and are not accepted by the pilots. An increase in turbulence intensity aggravates the influence of pitch damping reduction and control effectiveness increase on the flying qualities. Author (ESA)

N85-27881# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Brunswick (West Germany). Abteilung Flaechenflugzeuge.

IDENTIFICATION OF GUST INPUT AND GUST RESPONSE CHARACTERISTICS FROM Do 28 TNT FLIGHT TEST DATA

Detlef Rohlf Nov. 1984 59 p refs In GERMAN; ENGLISH summary Report will also be announced as translation (ESA-TT-919)

(DFVLR-FB-84-48; ISSN-0171-1342) Avail: NTIS HC A04/MF A01; DFVLR, Cologne DM 21

A method to determine gust reponse characteristics and simultaneously estimate the discrete gust input from flight test data using system identification techniques is presented. The method is restricted to longitudinal motion of aircraft with separated wing and tail surfaces at low Mach numbers. The applicability of the method is demonstrated by analyzing free flight catapult tests and dynamic wind tunnel tests with models of the Do 28 TNT aircraft. A good fit of the measured and identified time histories is achieved by considering the dynamic terms which are important for angles of attack varying rapidly due to gusts. Author (ESA)

N85-27882# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Brunswick (West Germany). Abt. Flaechenflugzeuge.

PROPOSALS FOR THE DETERMINATION OF NECESSARY ELEVATOR HANDLING CHARACTERISTICS OF SAILPLANES IN HIGH SPEED RANGE

Gerhard Stich and Dietmar Schmerwitz Dec. 1984 38 p refs In GERMAN; ENGLISH summary

(DFVLR-FB-84-52) Avail: NTIS HC A03/MF A01; DFVLR, Cologne, DM 14.50

For high performance sailplanes with relaxed longitudinal static stability or slight instability in high speed range, pitch controllability using the elevator (stick deflection per load factor) is demonstrated by measurements in steady turns. A flight test program with a sailplane proves the theoretical investigations. A proposal for a simple procedure which allows the determination of pitch controllability in high speed range in the case of relaxed longitudinal static stability or slight instability is presented. Author (ESA)

N85-27883# Advisory Group for Aerospace Research and Development, Neuilly-Sur-Seine (France).

ACTIVE CONTROL SYSTEMS: REVIEW, EVALUATION AND PROJECTIONS

Loughton, England Mar. 1985 392 p refs In ENGLISH and FRENCH Symp. held in Toronto, 15-18 Oct. 1984 (AGARD-CP-384; ISBN-92-835-0375-9) Avail: NTIS HC A17/MF A01

Numerous topics relative to digital flight control systems are discussed. Active control technology applications, optimization of systems architecture for both reliability and costs control cam design, handling qualities, and the operational demonstration of systems reliability are among the topics covered. For individual titles, see N85-27884 through N85-27911.

N85-27884# Centre d'Etudes et de Recherches, Toulouse (France).

ACTIVE CONTROL TECHNOLOGY (ACT): PAST, PRESENT AND FUTURE

Marc J. Pelegrin *In* AGARD Active Control Systems: Rev., Evaluation and Projections Mar. 1985 30 p refs (For primary document see N85-27883 17-08)
Avail: NTIS HC A17/MF A01

The past, present and future developments in the field of active control technology are surveyed. The improvement of aircraft performance, the reduction of operating costs, and the reduction of workloads are seen as benefits derived from active control technology. R.J.F.

N85-27885# General Electric Co., Binghamton, N.Y.

THE STATE-OF-THE-ART AND FUTURE OF FLIGHT CONTROL SYSTEMS

In AGARD Active Control Systems: Rev., Evaluation and Projections Mar. 1985 4 p (For primary document see N85-27883 17-08)
Avail: NTIS HC A17/MF A01

The evolution of flight control systems from non-electronic primary controls with electronic secondary augmentation systems to modern electronic Primary Fly-By-Wire systems is traced. Current system configurations are related to their origins in both aircraft and electronics technology. The future of flight control technology is discussed in view of the payoff which is expected from the increased integration of the various aircraft control functions. The integration of the aerodynamic and propulsive control systems provides a new level of control which will make the aircraft dramatically more maneuverable. The coupling of the integrated flight control system with the avionics system will permit advanced guidance and attack modes which will combine to increase the lethality of the combat system. The system will reconfigure its control laws to allow continuation of the mission or at least controlled flight in the face of battle damage if sufficient control power, lift, and propulsion remain. System architecture will be such as to support advanced maintainability features which will provide vastly improved system availability and persistance. R.J.F.

N85-27886*# Systems Technology, Inc., Hawthorne, Calif.

A PERSPECTIVE ON SUPERAUGMENTED FLIGHT CONTROL ADVANTAGES AND PROBLEMS

Duane McRuer, Donald Johnston, and Thomas Myers *In* AGARD Active Control Systems: Rev., Evaluation and Projections Mar. 1985 20 p refs (For primary document see N85-27883 17-08) (Contract NAS2-11388)
Avail: NTIS HC A17/MF A01 CSCL 01C

Superaugmented aircraft are an important subclass of actively controlled, highly-augmented aircraft. The aircraft without augmentation is unstable, and the control system not only redresses the stability and control imbalance but also provides effective vehicle dynamics which may differ in kind from those associated with conventional aircraft. The properties of highly unstable aircraft and typical superaugmented control systems used to remedy their dynamic deficiencies are explored generically. The following topics are considered: basic flight control system architectures suitable to reduce or completely alleviate the unstable aircraft characteristics; the primary dynamic characteristics and regulatory properties of typical superaugmented aircraft control systems, including governing factors in the linear system, dominant mode characteristics, and fundamental stability margin properties; and flying qualities features for superaugmented aircraft with rate command/attitude hold, extended bandwidth, and attitude command configurations. R.J.F.

N85-27887# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Brunswick (West Germany). Inst. fuer Flugmechanik.

ASPECTS OF APPLICATION OF ACT SYSTEMS FOR PILOT WORKLOAD ALLEVIATION

K. Wilhelm and B. Gmelin *In* AGARD Active Control Systems: Rev., Evaluation and Projections Mar. 1985 20 p refs (For primary document see N85-27883 17-08)
Avail: NTIS HC A17/MF A01

An essential element in the construction of future civil and military aircraft will be the inclusion of Active Control Technology (ACT) in the design process. This will be true for fixed-wing aircraft as well as for rotary-wing aircraft. The implementation of ACT makes possible improvements in flight performance and handling qualities. In particular, ACT can lead to alleviation of pilot workload in performing a specific task. This can be achieved by reducing undesirable motions and effects and adjusting the aircraft dynamics to a certain flight task and to the pilot. The above-mentioned problem areas concerning the implementation of ACT are discussed. Piloting problems with conventional systems and the influence of ACT systems on flying qualities and pilot workload are covered. Results from wind tunnel testing and flight testing using a BO 105 type helicopter and the HFB 320 in-flight simulator are given. R.J.F.

N85-27888# General Dynamics Corp., Fort Worth, Tex.

APPLICATION OF AFTI/F-16 TASK-TAILORED CONTROL MODES IN ADVANCED MULTIROLE FIGHTERS

Ronald D. Toles, Donald R. McMonagle (Air Force, Edwards AFB, Calif.), Daniel C. Anderson, and John H. Watson *In* AGARD Active Control Systems: Rev., Evaluation and Projections Mar. 1985 11 p refs (For primary document see N85-27883 17-08)
Avail: NTIS HC A17/MF A01

The next generation of multirole fighter aircraft will benefit from recent advances in flight control technology. The advent of digital fly-by-wire flight control capability for vehicles with relaxed static stability, as recently demonstrated by the AFTI/F-16, means a much higher level of performance is now attainable in handling qualities and weapon delivery effectiveness. Specifically, digital implementation of control laws permits the designer to attain a higher level of man/machine capability and performance, even at the flight envelope extremities. Multiple, separate task-tailored modes can be designed and employed to perform tasks with distinctly different flight dynamics requirements, achieving better performance than any single, multipurpose mode. Recently developed design concepts which support the above assertions are discussed. These concepts were employed on the AFTI/F-16 aircraft which dramatically demonstrated the benefits of digital flight control and task-tailored modes. R.J.F.

N85-27889# Grumman Aircraft Engineering Corp., Bethpage, N.Y.

X-29 DIGITAL FLIGHT CONTROL SYSTEM DESIGN

A. Whitaker and J. Chin *In* AGARD Active Control Systems:

Rev., Evaluation and Projections Mar. 1985 13 p refs (For primary document see N85-27883 17-08)
Avail: NTIS HC A17/MF A01

The X-29 Technology Demonstrator is a Forward Swept Wing Aircraft with primary longitudinal control provided by a large canard. The wing body is balanced to be neutrally stable for minimum drag. The canard is sized for high maneuverability resulting in a configuration which is 35% unstable. This configuration with its high aerodynamic efficiency became practical through the application of Active Control System Technology in the design of the Digital Flight Control System. The design concept for the X-29 flight control system was to utilize the available state-of-the-art and existing hardware to fly a very unusual aircraft. The purpose was to achieve an Advanced Application of Control Configured Vehicle with minimum cost and risk in the hardware development. As a result, the system architecture is very conservative using demonstrated techniques. The Normal Longitudinal Control Law, on the other hand, is based on Modern Control Theory. The unique features of the aircraft configuration, the control system architecture, and control surface arrangement are discussed. The hardware selected for implementation is described. The control law development is outlined to include the constraints which result from the 35% static instability. R.J.F.

N85-27890# Royal Aircraft Establishment, Bedford (England). Flight Systems Dept.
THE EVOLUTION OF ACS FOR HELICOPTERS: CONCEPTUAL SIMULATION STUDIES TO PRELIMINARY DESIGN
J. S. Winter, G. D. Padfield, and S. L. Buckingham *In* AGARD Active Control Systems: Rev., Evaluation and Projections Mar. 1985 14 p refs (For primary document see N85-27883 17-08)
Avail: NTIS HC A17/MF A01

In the development of suitable control algorithms for future active control technology battlefield helicopters, handling qualities appropriate to a wide range of tasks will need to be identified and incorporated into the design process before detailed control laws may be defined. Work in identifying appropriate characteristics through piloted simulation studies of a conceptual model of the controlled helicopter, subsequent control law studies and the use of computer aided design and analysis of the sensitivity of the controlled vehicle are discussed. R.J.F.

N85-27891# Smiths Industries Ltd., Bishops Cleeve (England).
ACT APPLIED TO HELICOPTER FLIGHT CONTROL
W. R. Richards *In* AGARD Active Control Systems: Rev., Evaluation and Projections Mar. 1985 12 p refs (For primary document see N85-27883 17-08)
Avail: NTIS HC A17/MF A01

Benefits of ACT applied to helicopters are potentially significant resulting in a considerable challenge to avionic equipment suppliers. The impact of mechanical link removal and replacement by electrical/optical signalling is discussed. ACT control systems configurations suitable for installation in helicopters in the 1988 and 1992 time scales with anticipation of continued component technological development are identified. New control laws are discussed based on requirements for higher bandwidth controllers, and non-interaction of control axes. Author

N85-27892# Messerschmitt-Boelkow-Blohm G.m.b.H., Munich (West Germany). Aircraft Div.
SOME FLIGHT TEST RESULTS WITH REDUNDANT DIGITAL FLIGHT CONTROL SYSTEMS
U. Korte *In* AGARD Active Control Systems: Rev., Evaluation and Projections Mar. 1985 14 p refs (For primary document see N85-27883 17-08)
Avail: NTIS HC A17/MF A01

Under contract of the German MOD a quadruredundant, full authority digital Flight Control System has been developed by MBB for use in naturally unstable aircraft and flight tested in a single seater F-104 G which has been modified as a CCV demonstrator aircraft. From Dec. 1977 to Nov. 1981 the new FCS was tested in 118 flights in five different configurations of the aircraft. 22 of the flights were made in unstable configurations with instabilities up to 22 % MAC. In a follow-on program from Aug. 1982 to April 1984 a simple digital Backup-Controller (Software) and an integrated digital Autopilot were developed and successfully flight tested. Total number of flights with the digital FBW-system was 176. Some of the experiences and results are presented which were made with the operational FBW-system and the backup-software. Author

N85-27893# British Aerospace Public Ltd. Co., Lancashire (England). Aircraft Group.
AN UPDATE OF EXPERIENCE ON THE FLY BY WIRE JAGUAR EQUIPPED WITH A FULL-TIME DIGITAL FLIGHT CONTROL SYSTEM
E. Daley *In* AGARD Active Control Systems: Rev., Evaluation and Projections Mar. 1985 15 p refs (For primary document see N85-27883 17-08)
Avail: NTIS HC A17/MF A01

An overview of the Fly By Wire Jaguar Demonstrator Program which was recently successfully completed with the flight trials of a highly unstable configuration of 10% negative maneuver margin. The aircraft is unique, being equipped from the outset with a quadruplex digital flight control system, with no form of electrical or mechanical backup system. The U.K. demonstrator program was sponsored by MoD, with the aim of the design, development and demonstration of a safe, practical, full time fly by wire flight control system for a combat aircraft. The primary aim was achieved in 1981 with the first flight of the aircraft, and further objectives of the flight demonstration of the aircraft in a highly unstable configuration in pitch, and with a Stall Departure/Spin Prevention system, was successfully completed. The flight control system, its flight certification and all phases of its flight trials is briefly described. Author

N85-27894# British Aerospace Aircraft Group, Brough (England). Aircraft Group.
ACT FLIGHT RESEARCH EXPERIENCE
D. J. Walker and R. M. Horner (RAE, Farnborough) *In* AGARD Active Control Systems: Rev., Evaluation and Projections Mar. 1985 7 p (For primary document see N85-27883 17-08)
Avail: NTIS HC A17/MF A01

Hunter XE 531 was the subject of a 15 year ACT program. The initial years involved the design, implementation and flight testing of a full authority quadruplex FCS flight control system. Using the aircraft as an experimental facility, a joint program emerged with British Aerospace, concentrating on handling aspects, ending with the loss of the aircraft through engine failure on take-off in 1982. The whole program is reviewed and the large variety of multidisciplinary topics covered are briefly described. Author

N85-27895# McDonnell Aircraft Co., St. Louis, Mo.
OPERATIONAL AND DEVELOPMENTAL EXPERIENCE WITH THE F/A-18A DIGITAL FLIGHT CONTROL SYSTEM
W. A. Moran *In* AGARD Active Control Systems: Rev., Evaluation and Projections Mar. 1985 13 p (For primary document see N85-27883 17-08)
Avail: NTIS HC A17/MF A01

The control system of the F/A-184 Hornet is a four channel fly by wire system using digital processors. During the development of the F/A-18, more than 75 control law variations were flown. Many of these variations were made necessary by flexible aerodynamic characteristics which sometimes defied prediction and by evolving structural loads requirements, as well as by the usual refinements in control laws resulting from flight experience. The digital flight control computer provided the ability to make these changes with relative ease. It also provided the flexibility to solve problems which on past generation aircraft might have been treated either with placards or with expensive structural modifications. The control system and the testing of the system is described in detail. Author

N85-27896# Naval Air Test Center, Patuxent River, Md. Strike Aircraft Test Directorate.
FLIGHT TESTING AND DEVELOPMENT OF THE F/A-18A DIGITAL FLIGHT CONTROL SYSTEM

R. A. Burton, B. T. Kneeland, U. H. Rabin (Systems Control Technology, Inc., Palo Alto, Calif.), and R. S. Hansen (Systems Control Technology, Inc., Palo Alto, Calif.) *In* AGARD Active Control Systems: Rev., Evaluation and Projections Mar. 1985 18 p refs (For primary document see N85-27883 17-08)
Avail: NTIS HC A17/MF A01

The improvement in the F/A-18 handling qualities from level 3 to level 1 for several mission tasks is documented. A new approach to the problem of extracting equivalent system models are handling qualities characteristics for fully augmented aircraft is introduced. This approach identified equivalent aerodynamic parameters and time delays of the flight control system and instrumentation system. This approach makes use of a mature and efficient integrated system identification procedure which uses several algorithms including a maximum likelihood method. This advanced equivalent system analysis method and the use of closed loop pilot mission related task testing are used to evaluate the F/A-18 digital FCS during its development. This is in contrast to classical open loop test techiques such as droplet inputs which gave little insight into the FCS and airframe interface. The correlation between equivalent time delays and the pilot handling qualities rating's obtained from closed loop mission task demonstrate that the equivalent system methodology can successfully be used to document the handling qualities of a highly augmented aircraft. In addition, the flexibility of the F/A-18 digital FCS allow for the correction of handling qualities and structural problems in a manner that has not previously been possible. Author

N85-27897# Dornier-Werke G.m.b.H., Friedrichshafen (West Germany).
OLGA: AN OPEN LOOP GUST ALLEVIATION SYSTEM
Hartmut Boehret, Bernd Krag (DFVLR, Brunswick), and Jean Skudridakis (DFVLR, Wesseling, West Germany) *In* AGARD Active Control Systems: Rev., Evaluation and Projections Mar. 1985 16 p refs (For primary document see N85-27883 17-08)
Avail: NTIS HC A17/MF A01

Aircraft with a modern wing of high aerodynamic efficiency and low wing loading are sensitive to gusts and, therefore, only offer limited passenger comfort in turbulent weather. The OLGA (Open Loop Alleviation) system was developed in cooperation with the DFVLR to improve the passenger ride comfort for such types of aircraft. The open loop principle was chosen because investigations showed this to be superior to a feed back type system. The gust angle of attack, calculated from sensor signals determines the performance of the system. Symmetric aileron deflection and the elevator are used for the compensation of the gust induced lift and pitching moment. Both control surfaces are operated by electromechanical actuators. After theoretical design work, the open loop principle was the subject of intensive wind tunnel investigation using a remotely controlled wind tunnel model of the Do 28 TNT experimental aircraft. After realizing the hardware, the system was implemented and flight tested in the real Do 28 TNT airplane. The flight test results and its comparison with those obtained from the hardware simulation and the wind tunnel investigations are discussed. Author

N85-27898*# Lockheed-California Co., Burbank.
DEMONSTRATION OF RELAXED STATIC STABILITY ON A COMMERCIAL TRANSPORT
Jerry J. Rising, Walter J. Davis, and Craig S. Willey *In* AGARD Active Control Systems: Rev., Evaluation and Projections Mar. 1985 18 p refs (For primary document see N85-27883 17-08) (Contract NAS1-15326)
Avail: NTIS HC A17/MF A01 CSCL 01C

The application of relaxed static stability was studied under a program to determine ways of improving the energy efficiency in current and future transport aircraft. Pitch active control systems (PACs) were developed for application in the near term to current aircraft and in the next generation to advanced aircrft of the future. Analyses identified potential drag benefits of: (1) 2% for current transport aircraft with neutral stability; and (2) as much as 17% for next generation aircraft with high aspect ratio supercritical wings which must operate 10 to 15% statistically unstable to achieve optimum performance. Flight test evaluations of the near-term PACs were conducted to a 3% mean aerodynamic chord (MAC) negative static margin on a Lockheed L-1011 aircraft. The advanced PACs was demonstrated to a 20% MAC negative static margin on a piloted visual motion simulator at the NASA Langley Research Center. Test results for both systems showed flying qualities characteristics as good as current conventional aircraft. M.G.

N85-27899# Messerschmitt-Boelkow-Blohm G.m.b.H., Hamburg (West Germany). Transport Aircraft Div.
REALISATION OF RELAXED STATIC STABILITY ON A COMMERCIAL TRANSPORT
U. P. Graeber *In* AGARD Active Control Systems: Rev., Evaluation and Projection Mar. 1985 11 p refs (For primary document see N85-27883 17-08)
Avail: NTIS HC A17/MF A01

The requirements of some airlines to increase the fuel capacity of a given transport aircraft led to a combined solution of an additional tank and the application of relaxed static stability. Some steps that led to the final solution are reviewed and some of its problems and benefits are shown. Author

N85-27900*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
ACTIVE CONTROL TECHNOLOGY EXPERIENCE WITH THE SPACE SHUTTLE IN THE LANDING REGIME
Bruce G. Powers *In* AGARD Active Control Systems: Rev., Evaluation and Projections Mar. 1985 9 p refs (For primary document see N85-27883 17-08)
Avail: NTIS HC A17/MF A01 CSCL 01C

The shuttle program took on the challenge of providing a manual landing capability for an operational vehicle returning from orbit. Some complex challenges were encountered in developing the longitudinal flying qualities required to land the orbiter manually in an operational environment. Approach and landing test flights indicated a tendency for pilot-induced oscillation near landing. Changes in the operational procedures reduced the difficulty of the landing task, and an adaptive stick filter was incorporated to reduce the severity of any pilot-induced oscillatory motions. Fixed-base, moving-base, and in-flight simulations were used for the evaluations, and in general, flight simulation has been the only reliable means of assessing the low-speed longitudinal flying qualities problems. Overall, the orbiter control system and operational procedures have produced a good capability for routinely performing precise landings in a large, unpowered vehicle with a low lift-to-drag ratio. Author

N85-27901# London Univ. (England).
THE AERODYNAMICS OF CONTROL
A. D. Young *In* AGARD Active Control Systems: Rev., Evaluation and Projections Mar. 1985 17 p refs (For primary document see N85-27883 17-08)
Avail: NTIS HC A17/MF A01

Traditional forms of control, novel forms developed to deal with flight conditions where the traditional forms lose effectiveness, and direct force controls are reviewed. Dynamic effects, missile controls and computational methods for predicting the aerodynamic characteristics of controls (or motivators) are briefly discussed. Finally, comments are offered on major areas calling for future research. Author

N85-27902*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
ACTIVE CONTROL LANDING GEAR FOR GROUND LOAD ALLEVIATION
John R. McGehee and David L. Morris (AFWAL) *In* AGARD Active Control Systems: Rev., Evaluation and Projections Mar. 1985 12 p refs (For primary document see N85-27883 17-08)
Avail: NTIS HC A17/MF A01 CSCL 01C

Results of analytical and experimental investigations of a series-hydraulic active control landing gear show that such a gear is feasible when using existing hardware and is very effective in reducing loads, relative to those generated by a conventional

(passive year) gear, transmitted to the airframe during ground operations. Analytical results obtained from an active gear, flexible aircraft, take-off and landing analysis are in good agreement with experimental data and indicate that the analysis is a valid tool for study and initial design of series-hydraulic active control landing gears. An analytical study of a series-hydraulic active control main landing gear on an operational supersonic airplane shows that the active gear has the potential for improving the dynamic response of the aircraft and significantly reducing structural fatigue damage during ground operations. M.G.

N85-27903# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).
WING BUFFETING ACTIVE CONTROL TESTING ON A TRANSPORT AIRCRAFT CONFIGURATION IN A LARGE SONIC WIND-TUNNEL
Roger Destuynder *In* AGARD Active Control Systems: Rev., Evaluation and Projections Mar. 1985 10 p refs In FRENCH; ENGLISH summary (For primary document see N85-27883 17-08)
Avail: NTIS HC A17/MF A01

A large half-model, duplicating the structural characteristics of a typical civil transport aircraft, was developed to study the unsteady response of active flaperons in the ONERA/S1 Modane Sonic Tunnel. The buffeting envelope results at large angles of attack or large Mach numbers were analyzed and the structural response to the buffeting phenomena was damped by introducing unsteady aerodynamic forces generated by the active flaperons. Thus a multicontrol system, operating on the various eigen modes of the wing structure was applied. Significant reduction of the consequences of this buffeting, both structural strain (fatigue) and airframe motion (comfort), were obtained, which could be translated into an effective widening of the usable flight envelope. Author

N85-27904# British Aerospace Public Ltd. Co., Brough (England). Aircraft Group.
A MODULAR DISSIMILAR REDUNDANT COMPUTER DESIGNED FOR HIGH INTEGRITY CONTROL
S. M. Wright and R. G. Burrage (Lucas Aerospace Limited) *In* AGARD Active Control Systems: Rev., Evaluation and Projections Mar. 1985 8 p refs (For primary document see N85-27883 17-08)
Avail: NTIS HC A17/MF A01

Digital circuits present considerable testing problems since to prove the correct operation of the logic, each possible logical state has to be shown to function as expected. As digital VLSI designs become more complex, this absolute proof of design and manufacturing correctness has become impossible. In order to apply these devices in full authority high integrity control systems suitable precautions must be taken to avoid the consequences should such a common mode data dependant error be encountered. A pseudo code based dissimilar modular multiprocessor design is described as a possible routine way of applying dissimilar techniques at minimum cost. The pseudo code approach is shown to have advantages for the production of an integrated software support environment and the modularity is shown to allow a number of possible control system architecture developments. These are analyzed using a safety map approach and conclusions drawn. Author

N85-27905# National Aerospace Lab., Amsterdam (Netherlands).
HOW TO HANDLE FAILURES IN ADVANCED FLIGHT CONTROL SYSTEMS OF FUTURE TRANSPORT AIRCRAFT
M. F. G. vanGool *In* AGARD Active Control Systems: Rev., Evaluation and Projections Mar. 1985 11 p refs (For primary document see N85-27883 17-08)
Avail: NTIS HC A17/MF A01

Indications exist that future transport aircraft will be designed according to active control technology concepts, using fly-by-wire flight control systems. Some philosophical considerations on the treatment of failures in these advanced flight control systems are given both from the industry and from the certification authorities point of view. It is concluded that early cooperation of parties involved is of utmost importance. Some results of an exploratory simulator investigation directed at the pilot appreciation of degradation in the aircraft handling qualities after failures in the primary flight control system are included. One of the problems encountered was large variability of the pilot ratings. The existing handling qualities criteria can be shown to have difficulty in explaining the pilot rating trend. Author

N85-27906# Avions Marcel Dassault-Breguet Aviation, Saint-Cloud (France). Div. des Etudes Avancees.
THE INTERACTIVE GENERATION OF SPECIFICATIONS FOR AN ONBOARD SOFTWARE SERIES (GISELE) [GENERATION INTERACTIVE DE SPECIFICATIONS D'ENSEMBLE LOGICIEL EMBARQUE (GISELE)]
Jean Choplin and Daniel Beurrier *In* AGARD Active Control Systems: Rev., Evaluation and Projections Mar. 1985 11 p refs In FRENCH (For primary document see N85-27883 17-08)
Avail: NTIS HC A17/MF A01

GISELE is a software tool designed to be used for establishing software specifications for onboard systems which require a very high level of security. This interactive tool permits the design and editing of specifications in an appropriate language as well as the design of a very complete group of tests under the specifications. In addition, GISELE provides an aid to management and modification of specifications, and contributes a method for the means for the design and preparation of tests of the software constructed from these specifications. Transl. by A.R.H.

N85-27907# Societe Nationale Industrielle Aerospatiale, Toulouse (France).
CERTIFYING COMPLEX DIGITAL SYSTEMS ON CIVIL AVIATION AIRCRAFT [CERTIFICATION DES SYSTEMES DIGITAUX COMPLEXES A BORD D'AVIONS CIVILS]
P. Toulouse *In* AGARD Active Control Systems: Rev., Evaluation and Projections Mar. 1985 12 p In FRENCH (For primary document see N85-27883 17-08)
Avail: NTIS HC A17/MF A01

The certification of equipment using digital techniques creates a delay with regards to demonstrating the security level because the software which controls these systems is subject to a new category of definition errors which are not present in analog systems. The demonstration of an acceptable level of security is applied in a qualitative manner considering together a total analysis equipment faults, a process of verifying the software in relation to the criticality of the function provided by the equipment using the software, and, if necessary, by architectural precautions which provide freedom from the consequences of eventual latent software errors or of not easily predicted failure modes of equipment. This effort should be reflected in documentation acknowledged as acceptable by all parties to the certification. Transl. by A.R.H.

N85-27908# Messerschmitt-Boelkow-Blohm G.m.b.H., Munich (West Germany).
THE FLIGHT CONTROL SYSTEM FOR THE EXPERIMENTAL AIRCRAFT PROGRAMME (EAP) DEMONSTRATION AIRCRAFT
H.-J. Kaul, F. Sella (Aeritalia, Turin), and M. J. Walker (British Aerospace P.L.C., Preston, England) *In* AGARD Active Control Systems: Rev., Evaluation and Projections Mar. 1985 16 p refs (For primary document see N85-27883 17-08)
Avail: NTIS HC A17/MF A01

The EAP is designed to be a highly maneuverable combat aircraft with a primary role of air superiority and a secondary role of ground attack. The performance capability is optimized by making the aircraft both longitudinally and directionally aerodynamically unstable in parts of the flight envelope. This requires artificial stabilization which is provided by the flight control system (FCS). The control laws also include control of angle of attack to prevent departure and spin, and features to safeguard the structure, to give a carefree maneuvering capability. The FCS is a full time fly by wire system based upon quadruplex digital computing and duo-duplex primary actuation, requiring no facility for reversion to back up or mechanical control. The system includes an extensive preflight test capability which checks that the system is fully operational prior to flight. It is designed to have a very high level

of integrity; the design aim is to achieve a safety critical failure rate of less than 1.0 x 10 to the -6 power per flight hour. Author

N85-27909# Boeing Military Airplane Development, Seattle, Wash.
AUTOMATIC FLIGHT CONTROL MODES FOR THE AFTI/F-111 MISSION ADAPTIVE WING AIRCRAFT
M. R. Evans, R. J. Hynes, D. C. Norman, and R. E. Thomasson *In* AGARD Active Control Systems: Rev., Evaluation and Projections Mar. 1985 13 p (For primary document see N85-27883 17-08)
Avail: NTIS HC A17/MF A01

The advanced fighter technology integration F-111 mission adaptive wing (AFTI/F-111 MAW) is a joint Air Force and NASA Program that involves equipping an experimental F-111 aircraft with a variable camber wing and control modes that utilize the capabilities of this advanced technology wing. These new control modes are both manual and automatic modes that use variable camber to increase the performance of the aircraft. The automatic modes that have been added are: (1) maneuver camber control (MCC) - varies the camber to maximize lift/drag (L/D); (2) cruise camber control (CCC) - varies the camber to maximize horizontal velocity using an online optimization technique; (3) maneuver load control (MLC) - directly controls wing root bending moment once a threshold has been exceeded; and (4) maneuver enhancement and gust alleviation (ME/GA) - generates variable camber and horizontal tail commands to increase the maneuver response of the aircraft to pilot inputs and reduce the gust induced normal acceleration. These modes were integrated with the existing F-111 command augmentation system in a dual digital fail safe control system configuration for flight testing. Author

N85-27910# Air Force Wright Aeronautical Labs., Wright-Patterson AFB, Ohio.
THE STOL AND MANEUVER TECHNOLOGY PROGRAM INTEGRATED CONTROL SYSTEM DEVELOPMENT
David J. Moorhouse and David R. Selegan *In* AGARD Active Control Systems: Rev., Evaluation and Projections Mar. 1985 10 p refs (For primary document see N85-27883 17-08)
Avail: NTIS HC A17/MF A01

A technology demonstration program was initiated to flight validate and mature near-term technologies applicable to adding STOL capability to a supersonic fighter, with a goal of also enhancing combat mission performance using the same technologies. A key technology is the development of a control system to integrate flight, propulsion, braking and steering controls. The STOL and Maneuver Technology Demonstration Program is defined with emphasis on the control system development. Many design options are available for such a system and criteria are not well defined. The expected benefits and problems of the control system development, the design options, the status of control system and flying qualities design criteria and the specific approach taken in defining program requirements are discussed. Finally, the expected contribution to future aircraft designs is examined. Author

N85-27911# Westland Aircraft Ltd., Yeovil (England). Systems Technology.
THE EVOLUTION OF ACTIVE CONTROL TECHNOLOGY SYSTEMS FOR THE 1990'S HELICOPTER
G. C. F. Wyatt *In* AGARD Active Control Systems: Rev., Evaluation and Projections Mar. 1985 11 p refs (For primary document see N85-27883 17-08)
Avail: NTIS HC A17/MF A01

The primary flight control system requirements for both military and civil helicopters operating in the 1990's are reviewed and a rationale for system architectures which maximize the common features of military and civil active control systems is proposed. While the need for caution is recognized if system performance is not to be compromised through an unbalanced application of the methodology, substantial cost and weight savings are predicted. The particularly demanding problems of the avoidance of common mode system faults in a civil application are addressed and a solution to these problems is proposed. Author

09 RESEARCH AND SUPPORT FACILITIES (AIR)

Includes airports, hangars and runways; aircraft repair and overhaul facilities; wind tunnels; shock tube facilities; and engine test blocks.

For related information see also *14 Ground Support Systems and Facilities (Space).*

N85-27912 Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Goettingen (West Germany). Inst. fuer Experimentelle Stroemungsmechanik.
ADAPTIVE WALL WIND TUNNELS AND WALL INTERFERENCE CORRECTION METHODS
H. Hornung, ed. and E. Stanewsky, ed. 1984 42 p refs Presented at European Mech. Colloq. No. 187, Goettingen, West Germany, 15-17 Oct. 1984
(DFVLR-IB-222-84-A-37) Avail: Issuing Activity

Wind tunnel tests involving adaptive wind tunnel walls, partially open wind tunnel walls, and side wall interference were discussed. Transonic, cryogenic, and supersonic wind tunnels were described. Author (ESA)

N85-27913 Duits-Nederlandse Windtunnel, Noordoostpolder (Netherlands).
CONSTRUCTION 1976-1980: DESIGN, MANUFACTURING, CALIBRATION OF THE GERMAN-DUTCH WIND TUNNEL (DNW)
M. Seidel, ed. 1982 137 p refs Original contains color illustrations
Copyright. Avail: Issuing Activity

A low speed wind tunnel was built. It has 3 closed, interchangeable test sections with cross sectional sizes of 9.5 m x 9.5 m, 8 m x 6 m and 6 m x 6 m with maximum continuous wind speeds of at least 55, 100 and 130 m/sec respectively in the presence of a typical model; an open test section for aeroacoustic measurements (8 m x 6 m, 80 m/sec); and an air exchange system for the rapid removal of hot or contaminated gases, e.g., during tests with engine simulators or full scale engines. It has a continuous drive power of 11.5 MW plus 10% design margin to cover prediction risks. Intermittent use of overload capacity was anticipated to provide short duration maximum speeds up to 62 and 145 m/sec for the 9.5 m x 9.5 m and the 6 m x 6 m respectively. In empty test sections, relative deviation of static and dynamic pressure across the center section is + or - 0.3%; local deviation of flow direction: + or - 0.1 deg; local temperature deviation = + or - 0.5 C; turbulence: 0.1 to 0.2%. Author (ESA)

N85-27914*# National Aeronautics and Space Administration, Washington, D. C.
TEST DEVICES FOR AERONAUTICAL RESEARCH AND TECHNOLOGY
Apr. 1985 65 p Transl. into ENGLISH from "Versuchsanlagen fuer Luftfahrtforschung und Luftfahrttechnologie" Cologne, Dec. 1981 p A2-1-A2-11, B1.1-1-B1.1-3, B2.1-1-B2.1-2, B4.1-1-B4.1-10, B4.2-1-B4.2-5, and B4.3-1-B4.3-3 Transl. by The Corporate Word, Inc., Pittsburgh Original document prepared by DFVLR, Cologne (Contract NASw-4006)
(NASA-TM-77651; NAS 1.15:77651) Avail: NTIS HC A04/MF A01 CSCL 14B

The objectives of the DFVLR in six areas are described: (1) transportation and communication systems; (2) aircraft, space technology, (4) remote sensing, (5) energy and propulsion technology; and (6) research and development. A detailed description of testing devices and other facilities required to carry out the research program is given. Author

N85-27915*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
EFFECT OF SUPERCONDUCTING SOLENOID MODEL CORES ON SPANWISE IRON MAGNET ROLL CONTROL
Colin P. Britcher Jun. 1985 25 p refs

(Grant NsG-7523)
(NASA-TM-86378; L-15924; NAS 1.15:86378) Avail: NTIS HC A02/MF A01 CSCL 14B

Compared with conventional ferromagnetic fuselage cores, superconducting solenoid cores appear to offer significant reductions in the projected cost of a large wind tunnel magnetic suspension and balance system. The provision of sufficient magnetic roll torque capability has been a long-standing problem with all magnetic suspension and balance systems; and the spanwise iron magnet scheme appears to be the most powerful system available. This scheme utilizes iron cores which are installed in the wings of the model. It was anticipated that the magnetization of these cores, and hence the roll torque generated, would be affected by the powerful external magnetic field of the superconducting solenoid. A preliminary study has been made of the effect of the superconducting solenoid fuselage model core concept on the spanwise iron magnet roll torque generation schemes. Computed data for one representative configuration indicate that reductions in available roll torque occur over a range of applied magnetic field levels. These results indicate that a 30-percent increase in roll electromagnet capacity over that previously determined will be required for a representative 8-foot wind tunnel magnetic suspension and balance system design. Author

N85-27916*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
BACKGROUND NOISE MEASUREMENTS FROM JET EXIT VANES DESIGNED TO REDUCED FLOW PULSATIONS IN AN OPEN-JET WIND TUNNEL
Danny R. Hoad (Army Research and Technology Labs., Hampton, Va.) and Ruth M. Martin Jun. 1985 48 p refs
(DA Proj. 1L1-63309-AH-76)
(NASA-TM-86383; L-15923; NAS 1.15:86383; AVSCOM-TM-85-B-1) Avail: NTIS HC A03/MF A01 CSCL 14B

Many open jet wind tunnels experience pulsations of the flow which are typically characterized by periodic low frequency velocity and pressure variations. One method of reducing these fluctuations is to install vanes around the perimeter of the jet exit to protrude into the flow. Although these vanes were shown to be effective in reducing the fluctuation content, they can also increase the test section background noise level. The results of an experimental acoustic program in the Langley 4- by 7-Meter Tunnel is presented which evaluates the effect on tunnel background noise of such modifications to the jet exit nozzle. Noise levels for the baseline tunnel configuration are compared with those for three jet exit nozzle modifications, including an enhanced noise reduction configuration that minimizes the effect of the vanes on the background noise. Although the noise levels for this modified vane configuration were comparable to baseline tunnel background noise levels in this facility, installation of these modified vanes in an acoustic tunnel may be of concern because the noise levels for the vanes could be well above background noise levels in a quiet facility. Author

N85-27917# Mitre Corp., McLean, Va. Metrek Div.
AIRPORT AND AIRWAY SYSTEM COST ALLOCATION MODEL. VOLUME 7: USER'S MANUAL
J. C. Scalea Sep. 1977 66 p
(Contract DOT-FA69NS-162)
(AD-A152877; MTR-7610-Vol-7) Avail: NTIS HC A04/MF A01 CSCL 01/5

This volume constitutes the user's manual for the computer program written to automate the calculations involved in the allocation of costs to the various airport and airway system users. It includes a very brief summary of the allocation methodology which is developed in detail in previous volumes. The program itself is interactive in nature and this manual contains a summary of the commands and input data formats required by the user for successful program execution. A sample terminal session is included as well as a program listing and a sample of the output. GRA

N85-27918# Erno Raumfahrttechnik G.m.b.H., Bremen (West Germany).
BOTANY FACILITY PHASE A STUDY. CORE PAYLOAD NUMBER 6 EURECA CARRIER, VOLUME 1 Final Report
H. Boerchers, Laux, Loeser, J. Mathes, J. Meinke, Lafon (Bertin et Cie), Decaudin (Bertin et Cie), T. Tack (BTM, Antwerp), and A. Bressing (BTM, Antwerp) Paris ESA May 1983 90 p 2 Vol.
(Contract ESA-5281/82/F)
(ESA-CR(P)-1978-Vol-1) Avail: NTIS HC A05/MF A01

A multiuser life science facility which enables scientists to carry out investigations on higher plants and fungi under a micro-g environment for extended times (up to 6 months) in a low Earth orbit (500 km, 28.5 deg inclination) to observe physiological aspects during a complete life cycle was developed for EURECA. Five missions within 10 years are envisaged. The facility consists of an incubator module with controlled CO2 and O2 atmosphere to house environmentally sensitive and related systems and subsystems; and an electronics module for the power conditioning and processor systems. Subsystems include video and film cameras, and a centrifuge. Author (ESA)

N85-27919# Erno Raumfahrttechnik G.m.b.H., Bremen (West Germany).
BOTANY FACILITY PHASE A STUDY. CORE PAYLOAD NUMBER 6 FOR EURECA CARRIER, VOLUME 2 Final Report
H. Boerchers, Laux, Loeser, J. Mathes, J. Meinke, Lafon (Bertin et Cie, Plaisir, France), Decaudin (Bertin et Cie, Plaisir, France), T. Tack (BTM, Antwerp, Netherlands), and A. Bressing (BTM, Antwerp, Netherlands) Paris ESA May 1983 357 p refs 2 Vol.
(Contract ESA-5281/82/F)
(BF-TD-DRD-03-Vol-2; ESA-CR(P)-1978-Vol-2) Avail: NTIS HC A16/MF A01

A multiuser life science facility which enables scientists to carry out investigations on higher plants and fungi under a micro-g environment for extended times (up to 6 months) in a low Earth orbit (500 km, 28.5 deg inclination) to observe physiological aspects during a complete life cycle was developed for EURECA. Five missions within 10 years are envisaged. The facility consists of an incubator module with controlled CO2 and O2 atmosphere to house environmentally sensitive and related systems and subsystems; and an electronics module for the power conditioning and processor systems. Subsystems include video and film cameras, and a centrifuge. Author (ESA)

N85-27920# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Goettingen (West Germany). Abt. Elastomechanik und Aeroelastische Stabilitaet.
THE GUST SIMULATION APPARATUS OF THE 3m X 3m LOW SPEED WIND TUNNEL OF THE DFVLR IN GOETTINGEN, WEST GERMANY
Raymond Freymann Jun. 1984 38 p refs In GERMAN; ENGLISH summary
(DFVLR-FB-85-04; ISSN-0171-1342) Avail: NTIS HC A03/MF A01; DFVLR, Cologne DM 14.50

A gust simulation apparatus was fitted into a 3m x 3m low speed wind tunnel to increase the range of test possibilities. The design of the gust generating system and of the test method used for determination of the gust flow behind the gust generator is described. Graphical representations of experimentally determined gust flow distributions in the wind tunnel measuring section are shown. Author (ESA)

N85-27921# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Oberpfaffenhofen (West Germany). Abt. Prozessortechnik.
DATA PROCESSING ON THE ROTOR TEST STAND AT DFVLR IN BRUNSWICK: MICROPROGRAMMABLE INTERFACES AND ARRAY PROCESSOR AS KEY COMPONENTS IN A PDP 11 REAL TIME DATA ACQUISITION AND PROCESSING SYSTEM
Roland Seifert Jan. 1985 116 p refs In GERMAN; ENGLISH summary
(DFVLR-Mitt-85-03; ISSN-0176-7739) Avail: NTIS

HC A06/MF A01; DFVLR, Cologne DM 40.50

The construction and operation of data acquisition and processing systems on rotor test strands for studies of higher harmonic control of helicopter rotors in wind tunnels is discussed. The processing system consists of 3 MININET-coupled PDP 11 computers supported by microprogrammable PCM interfaces and by an array processor. The implementation of these components under the RSX 11 M operating system for the treatment of real time requirements, the structure of the software system, and the associated programming and testing aids are presented.

Author (ESA)

12 ASTRONAUTICS (GENERAL)

For extraterrestrial exploration see *91 Lunar and Planetary Exploration.*

N85-27922*# Stanford Univ., Calif.

FREE-SURFACE PHENOMENA UNDER LOW- AND ZERO-GRAVITY CONDITIONS Final Technical Report

Lambertus Hesselink Jun. 1985 8 p

(Grant NAG3-557)

(NASA-CR-175885; NAS 1.26:175885) Avail: NTIS HC A02/MF A01 CSCL 22A

A free surface experiment using a liquid doped with a fluorescent dye under sheet illumination is summarized. The work includes the selection of a CCD camera for use during the design stages of the experiment as well as a preliminary demonstration of this technique in the production of a contour map of a liquid-liquid interface with better than 0.1 mm resolution. With a different data sampling and storage procedure, the image processing is reduced to a simple thresholding procedure which can be done in hardware.

Author

N85-27923*# Ball Aerospace Systems Div., Boulder, Colo.

SHUTTLE-TETHERED SATELLITE SYSTEM DEFINITION STUDY EXTENSION Final Report

30 Jun. 1980 295 p

(Contract NAS8-32853)

(NASA-CR-171473; NAS 1.26:171473; F80-10) Avail: NTIS HC A13/MF A01 CSCL 22A

A system requirements definition and configuration study (Phase B) of the Tethered Satellite System (TSS) was conducted during the period 14 November 1977 to 27 February 1979. Subsequently a study extension was conducted during the period 13 June 1979 to 30 June 1980, for the purpose of refining the requirements identified during the main phase of the study, and studying in some detail the implications of accommodating various types of scientific experiments on the initial verification flight mission. An executive overview is given of the Tethered Satellite System definition developed during the study. The results of specific study tasks undertaken in the extension phase of the study are reported. Feasibility of the Tethered Satellite System has been established with reasonable confidence and the groundwork laid for proceeding with hardware design for the verification mission.

B.W.

N85-27924*# Ball Aerospace Systems Div., Boulder, Colo. Systems and Antennas Organization.

SHUTTLE-TETHERED SATELLITE SYSTEM DEFINITION STUDY. VOLUME 1: EXECUTIVE STUDY Final Study Report

Feb. 1979 72 p

(Contract NAS8-32853)

(NASA-CR-171474; NAS 1.26:171474; DRMA-05-Vol-1; DPD-544-Vol-1) Avail: NTIS CSCL 22A

The Tethered Satellite System has great prospects for extending orbital operations capability of the Space Transportation System to science, applications, and technology projects not otherwise attainable. The system will installed in the Shuttle Orbiter and will have the capability to deploy a captive satellite up to 100 km away from the Orbiter. Control and retrieval of the satellite are accomplished by means of a tether line connecting the satellite and the cargo bay mounted equipment in the Orbiter. At low satellite altitudes, the system will permit investigations of a duration that could not be pursued with sounding rockets of free-flying spacecraft. The propose of the Shuttle/Tethered Satellite System Definition Study was to produce the preliminary design, preliminary specifications, gross program plans, and program cost estimate for a 1982 operational verification flight. This was accomplished during a fifteen month effort under by the NASA George C. Marshall Space Flight Center (MSFC). The MSFC Phase 1 and related studies demonstrated the feasibility of the system and served as a starting point for the Phase 2 definition study.

B.W.

N85-27925# Los Alamos Scientific Lab., N. Mex. Earth and Space Science Div.

HISTORICAL PERSPECTIVE ON THE MOON BASE: THE BRITISH PERSPECTIVE

E. M. Jones and B. R. Finney (Hawaii Univ., Honolulu) 1984 12 p refs Presented at Lunar Base and Space Activities of the 21st Century, Washington, D.C., 29 Oct. 1984

(Contract W-7405-eng-36)

(DE85-005905; LA-UR-85-52; CONF-8410230-8) Avail: NTIS HC A02/MF A01

Among the many historical episodes that have relevance to the establishment of a human base, the voyages of Captain Cook, and the founding of Britain's Botany Bay colony in Australia seems particularly appropriate. The process resulting in the selection of Cook rewards study, as do his relations with the Admiralty, with the scientific establishment and with the scientists who accompanied him. Britain's tight control of the Botany Bay settlement and its unwillingness to promote early self-sufficiency may have delayed the time when Australia became self-supporting. Structuring the lunar base to offer opportunities for private initiatives may hasten the day when it becomes a self-supporting settlement rather than an externally supported scientific base on an Antartic model.

DOE

N85-27926# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Cologne (West Germany).

EUROPEAN UTILIZATION ASPECTS OF A US MANNED SPACE STATION, VOLUME 1 Final Report

Paris ESA Apr. 1983 65 p Prepared in cooperation with MBB GmbH, Bremen, West Germany, Aeritalia SpA, Turin, British Aerospace Aircraft Group, Bristol, Dornier-Werke GmbH, Friedrichshafen, West Germany, and Matra, Toulouse 2 Vol.

(Contract ESA-5243/82/F-FC(SC))

(ESA-CR(P)-1987-Vol-1) Avail: NTIS HC A04/MF A01

European payload candidates which can be beneficially supported by a manned space station (MSS) are identified. The required operational station support is assessed. Alternative approaches if no manned space station is available are discussed and the impact identified. The MSS is needed in life sciences, space technology, and materials science. The MSS needs to be completed by free flying platforms for automatic material processes, space sciences, and Earth observations. The majority of identified payload candidates are for basic research. Commercial payloads are only identified in telecommunications. Identification of commercial materials processing payloads depends on the results from Spacelab.

Author (ESA)

N85-27927# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Cologne (West Germany).

EUROPEAN UTILIZATION ASPECTS OF A US MANNED SPACE STATION, VOLUME 2 Final Report

Paris ESA Apr. 1983 393 p refs Prepared in cooperation with MBB GmbH, Bremen, West Germany, Aeritalia SpA, Turin, British Aerospace Aircraft Group, Bristol, Dornier-Werke GmbH, Friedrichshafen, West Germany, and Matra, Toulouse 2 Vol.

(Contract ESA-5243/82/F-FC(SC))

(ESA-CR(P)-1987-Vol-2) Avail: NTIS HC A17/MF A01

European payload candidates which can be beneficially supported by a manned space station (MSS) are identified. The required operational space station support is assessed. Alternative

approaches if no manned space station is available are discussed and the impact identified. The MSS is needed in life sciences, space technology, and materials science. The MSS need to be completed by free flying platforms for automatic material processes, space sciences, and Earth observations. The majority of identified payload candidates are for basic research. Commercial payloads are only identified in telecommunications. Identification of commercial materials processing payloads depends on the results from Spacelab. Author (ESA)

N85-27928# Erno Raumfahrttechnik G.m.b.H., Bremen (West Germany).
IN ORBIT INFRASTRUCTURE. VOLUME 1: EXECUTIVE SUMMARY
Paris ESA Jul. 1984 80 p
(Contract ESA-5602/83/F-FC(SC))
(RX011-002/84-Vol-1; ESA-CR(P)-2002-Vol-1) Avail: NTIS HC A05/MF A01

Based on the identified and projected European mission needs for Earth observation, telecommunications, space processing and scientific missions, mission requirements and in-orbit infrastructure (IOI) element function performances were established. Orbit change, rendezvous and docking, telemanipulator operations, automatic sample exchange, and automatic re-entry elements are applicable for the servicing equipment of a materials processing space platform, the orbital transfer and servicing system, and the re-entry vehicle (REV). Economic and technical arguments favor manned elements (STS) for launch/servicing/payload exchange/recovery for initial material processing missions in a 500 km/28.5 deg orbit. The introduction of Ariane 5 and REV gives Europe an independent servicing capability with similar launch costs but with higher reliance on automatic systems for rendezvous docking/servicing/payload exchange/recovery. Operational missions using Hermes, although not so economically attractive, provide Europe with an independent manned capacity. Author (ESA)

N85-27929# National Aerospace Lab., Amsterdam (Netherlands).
IRAS: SPACE TECHNOLOGY FROM THE NETHERLANDS
Leo Steijn, ed. May 1983 20 p Original contains color illustrations
(B85101841) Avail: NTIS HC A02/MF A01

The Infrared Astronomy Satellite telescope, spacecraft design, thermal control, onboard computer and data storage, communications, power supply, and integration and test are described. Ground operations and the advantages to Dutch industry are outlined.
Author (ESA)

13 ASTRODYNAMICS

Includes powered and free-flight trajectories; and orbit and launching dynamics.

No abstracts in this category.

14 GROUND SUPPORT SYSTEMS AND FACILITIES (SPACE)

Includes launch complexes, research and production facilities; ground support equipment, e.g., mobile transporters; and simulators.

For related information see also *09 Research Support Facilities (Air).*

No abstracts in this category.

15 LAUNCH VEHICLES AND SPACE VEHICLES

Includes boosters; manned orbital laboratories; reusable vehicles; and space stations.

N85-27930*# Rockwell International Corp., Downey, Calif. Space Station Systems Div.
SPACE STATION CREW SAFETY ALTERNATIVES STUDY. VOLUME 5: SPACE STATION SAFETY PLAN Final Report
G. H. Mead, R. L. Peercy, Jr., and R. F. Raasch Washington NASA Jun. 1985 114 p
(Contract NAS1-17242)
(NASA-CR-3858; NAS 1.26:3858; SSD84-0055) Avail: NTIS HC A06/MF A01 CSCL 22A

The Space Station Safety Plan has been prepared as an adjunct to the subject contract final report, suggesting the tasks and implementation procedures to ensure that threats are addressed and resolution strategy options identified and incorporated into the space station program. The safety program's approach is to realize minimum risk exposure without levying undue design and operational constraints. Safety objectives and risk acceptances are discussed. B.W.

N85-27931# Maschinenfabrik Augsburg-Nuernberg A.G., Munich (West Germany).
THE ARIANE LAUNCH VEHICLE IS THE KEY OF THE EUROPEANS TO THE SPACE MARKET [DIE TRAEGERRAKETE ARIANE IST DER SCHLUESSEL DER EUROPAER ZUM WELTRAUMMARKT]
Friedrich Laussermair 1984 7 p In GERMAN
Avail: NTIS HC A02/MF A01

The history and commercial future of Ariane are described. Arianespace got 30 orders and 14 reservations. Ariane 4 is being developed. The heaviest Ariane 4 version represents a payload increase of 70% compared to Ariane 3. Ariane 4 is expected to be competitive in space transportation until the mid-nineties. Ariane 5 is seen as a rival to the Space Transportation System; it has to be able to bring larger and heavier payloads into low and high orbits. Cooperation with the US in the construction of a space station can open interesting transportation tasks in the low orbit for Ariane 5. Author (ESA)

16 SPACE TRANSPORTATION

Includes passenger and cargo space transportation, e.g., shuttle operations; and rescue techniques.

For related information see also *03 Air Transportation and Safety* and *85 Urban Technology and Transportation.*

N85-27932# Air Force Technical Applications Center, Patrick AFB, Fla.
RESULTS FROM RADIATION MONITORING EQUIPMENT EXPERIMENT ON STS-11 Final Report, 15 Dec. 1983 - 1 Mar. 1984
R. G. Madonna, V. L. Brown, and S. E. Cash 14 Mar. 1985 32 p
(AD-A152531; AFTAC-TR-85-2) Avail: NTIS HC A03/MF A01 CSCL 18/4

The Radiation Monitoring Equipment (RME) was flown on STS-11 Space Shuttle Mission for the purpose of testing a concept for in-cabin, real-time crew dosimetry, and for the purpose of obtaining time resolved gamma-ray background data and neutron/proton background data. The RME consists of two instruments, EG&G HRM-III gamma-ray counter and EG&G Pocket REM Meter (PRM) neutron/proton dosimeter. The HRM-III was operated by the astronaut crew four times during the mission with each operation lasting 52.5 minutes. The PRM was operated twice during the mission with each operation lasting a minimum of 15 hours. The results from the HRM-III operations were plotted as a function

of time and as a function of ground position. The data show large increases in count rate during periods when the Orbiter was in the East Asian Anomaly. These data are consistent with the data obtained from other missions. The RPM results are displayed in tabular form. The average dose rate from these operations is .359mrem/hr ((2.84) x 10 to the 5th rad/hr). The total mission neutron/proton dosage predicted by these readings is approximately 60.30mrem (4.77mrads). GRA

17 SPACECRAFT COMMUNICATIONS, COMMAND AND TRACKING

Includes telemetry; space communications networks; astronavigation; and radio blackout.

For related information see also *04 Aircraft Communications and Navigation* and *32 Communications.*

No abstracts in this category.

18 SPACECRAFT DESIGN, TESTING AND PERFORMANCE

Includes spacecraft thermal and environmental control; and attitude control.

For life support systems see *54 Man/System Technology and Life Support.* For related information see also *05 Aircraft Design, Testing and Performance* and *39 Structural Mechanics.*

N85-27933*# National Aeronautics and Space Administration, Washington, D. C.

DESCENT VEHICLES

Ye. I. Popov May 1985 49 p Transl. into ENGLISH from Novoye v Zhizni, Nauke, Tekhn., Ser. Kosmonavtika, Astron. (Moscow), no. 4, 1985 p 1-64 Transl. by The Corporate Word, Inc., Pittsburgh

(Contract NASw-4006)

(NASA-TM-77654; NAS 1.15:77654) Avail: NTIS HC A03/MF A01 CSCL 22B

The creation of descent vehicles marked a new stage in the development of cosmonautics, involving the beginning of manned space flight and substantial progress in space research on the distant bodies of the Solar System. This booklet describes these vehicles and their structures, systems, and purposes. It is intended for the general public interested in modern problems of space technology. Author

N85-27934*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.

DEPLOYABLE CONTROLLABLE GEOMETRY TRUSS BEAM

Marvin D. Rhodes and Martin M. Mikulas, Jr. Jun. 1985 18 p refs

(NASA-TM-86366; L-15901; NAS 1.15:86366) Avail: NTIS HC A02/MF A01 CSCL 22B

A study was conducted on a truss beam structural concept that can deploy and maneuver in a serpentine manner to align or position the truss beam tip. The truss beam is composed of a series of rod members connected together at joints that provide the required rotational degrees of freedom. The current study was conducted to evaluate the requirements of the joints and define a mechanical assembly that could provide both high structural stiffness and the required maneuverability. The truss beam requires two joint types; both types were fabricated and incorporated in a demonstration model. An analysis of the concept was performed to define the location and orientation of the beam tip during deployment and serpentine maneuvers. Author

N85-27935*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.

SOLAR ARRAY FLIGHT EXPERIMENT

Jerry Slaby Apr. 1985 17 p

(NASA-TM-86506; NAS 1.15:86506) Avail: NTIS HC A02/MF A01 CSCL 22B

This is a closed form solution for the longitudinal oscillation of the Solar Array Flight Experiment (SAFE) blanket for all phases of deployment. The frequency response shows that the blanket frequency increases shortly before full deployment. That fact causes a coupling between the mast and the blanket frequency but, because of the relatively high speed of deployment, a buildup of resonance is unlikely. Author

N85-27936*# California Univ., San Diego. Automation and Robotics Panel.

AUTOMATION AND ROBOTICS FOR THE NATIONAL SPACE PROGRAM

25 Feb. 1985 142 p refs

(Grant NAGw-629)

(NASA-CR-175881; NAS 1.26:175881; CSI/85-01) Avail: NTIS HC A07/MF A01 CSCL 22B

The emphasis on automation and robotics in the augmentation of the human centered systems as it concerns the space station is discussed. How automation and robotics can amplify the capabilities of humans is detailed. A detailed developmental program for the space station is outlined. E.R.

N85-27937# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.

INCORPORATING CONTROL INTO THE OPTIMAL STRUCTURAL DESIGN OF LARGE FLEXIBLE SPACE STRUCTURES M.S. Thesis

T. V. Muckenthaler Dec. 1984 139 p

(AD-A152858; AFIT/GA/AA/84D-7) Avail: NTIS HC A07/MF A01 CSCL 22/2

An eigenspace optimization approach is used to incorporate optimal control into the structural design process for large flexible space structures. The equations of motion for an uncontrolled system are developed by deriving the kinetic and potential energy for the system and then using assumed modes to discretize the energies. These expressions are then linearized, the Lagrangian formed, and Lagrange equations written for the system. An existing optimal control law is incorporated to form the equations of motion for the controlled system. A parameter optimization technique is used to minimize the mass of the Draper/RPL configuration model involving eigenspace optimization. A computer algorithm is developed that effectively optimizes a global structural parameter vector to minimize the mass of the model, while constraining specified eigenvalues. The eigenvalue sensitivities are passed to a constrained function minimization program called CONMIN which minimizes the mass of the appendages. The constraints imposed restrict the first eigenvalue to the left half plane and the natural frequency of the third eigenvalue to a specified stable region. The result is an algorithm that incorporates an existing optimal control law into the structural optimization process. GRA

N85-27938# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.

MAXIMIZING THE SEMI-MAJOR AXIS FOR A FREELY CONING SOLAR SAILCRAFT M.S. Thesis

M. R. Borja Dec. 1984 151 p

(AD-A153175; AFIT/GA/AA/84D-2) Avail: NTIS HC A08/MF A01 CSCL 22/3

This thesis addresses the maximation of the circular orbit radius of an Earth-orbiting solar sail under free coning motion. The objective is to find the optimal sail settings producing the most change in the semi-major axis per orbit. Angular orientations with respect to sail nutation, precession, mean motion, and its angular momentum control the magnitude of the solar thrust along the sailcraft's velocity direction. A numerical search scheme uses a modified Newton-Rapson iteration method to identify sets of control parameters meeting certain optimality conditions that

produce a stationary value in a selected performance index. Such a scheme displays its vulnerability to a lack of a good initial guess. Three dimensional perspectives of the small perturbation equation describing the behavior of the change in semi-major axis facilitates the understanding of its cyclic nature and provides an excellent tool for identifying the various locations of possible maxima (and minima) as well as slope-critical area. The perspectives improves the initial guess for implementing maxima search schemes. A test case demonstrates the location of particular points of interest with few search iterations. GRA

N85-27939# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
MATHEMATICAL MODELING AND CONTROL OF A LARGE SPACE STRUCTURE AS APPLIED TO A SHUTTLE-ANTENNA CONFIGURATION M.S. Thesis
J. O. Dunstan Dec. 1984 131 p
(AD-A153269; AFIT/GA/AA/84D-3) Avail: NTIS HC A07/MF A01 CSCL 22/2

The equations of motion of a flexible shuttle-beam-antenna system are developed and discretized using an assumed modes approximation. The system was modeled as a cantilever beam rigidly attached to the shuttle with the motion of the antenna accounted for as forces and moments on the beam's free end. The equations of motion for the system were formed from the linearized kinetic and potential energies using Lagrange's method. The equations were put into matrix form, and the matrices were diagonalized. Linear optimal regulator techniques were employed to control the system. Two proof-mass actuators were modeled at the 40- and 80-foot positions along the beam. The shuttle was assumed to be able to be torqued about it's axes, as was the antenna. Initial runs of the ACOSS computer program showed the system to be stable with unit weighting on the weighting matrix. The system was driven unstable by changing the weightings on the flexible modes. The suppression algorithm in the program re-stabilized the system, as expected. GRA

N85-28185# Joint Publications Research Service, Arlington, Va.
STRUCTURE OF SYLDA DOUBLE LAUNCH SYSTEM FOR ARIANE
F. Chanut and M. Richard *In its* West Europe Rept.: Sci. and Technol. (JPRS-WST-84-024) 10 Jul. 1984 p 4-18 Transl. into ENGLISH from L'Aeron. et l'Astron. (Paris), no. 105, 1984 p 18-23 (For primary document see N85-28183 17-31)
Avail: NTIS HC A04/MF A01

19 SPACECRAFT INSTRUMENTATION

For related information see also *06 Aircraft Instrumentation* and *35 Instrumentation and Photography.*

N85-27968*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
THIN-FILM SENSORS FOR SPACE PROPULSION TECHNOLOGY Abstract Only
Walter S. Kim and David R. Englund *In its* Struct. Integrity and Durability of Reusable Space Propulsion Systems May 1985 p 183-188 refs (For primary document see N85-27941 17-20)
Avail: NTIS HC A09/MF A01 CSCL 22B

N85-27970*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
HEAT FLUX SENSOR CALIBRATOR Abstract Only
Curt H. Liebert *In its* Struct. Integrity and Durability of Reusable Space Propulsion Systems May 1985 p 195-198 refs (For primary document see N85-27941 17-20)
Avail: NTIS HC A09/MF A01 CSCL 22B

N85-27971*# Rockwell International Corp., Canoga Park, Calif.
FEASIBILITY OF MAPPING VELOCITY FLOW FIELDS IN SSME POWERHEAD BY LASER ANEMOMETRY TECHNIQUES Abstract Only
D. G. Pelaccio, L. K. Sharma, T. V. Ferguson, J. M. Maram, and S. Pinkowski *In* NASA. Lewis Research Center Struct. Integrity and Durability of Reusable Space Propulsion Systems May 1985 p 199 (For primary document see N85-27941 17-20)
(Contract NAS3-24356)
Avail: NTIS HC A09/MF A01 CSCL 22B

20 SPACECRAFT PROPULSION AND POWER

Includes main propulsion systems and components, e.g., rocket engines; and spacecraft auxiliary power sources.

For related information see also *07 Aircraft Propulsion, 28 Propellants and Fuels,* and *44 Energy Production and Conversion.*

N85-27940*# Tennessee Technological Univ., Cookeville. Dept. of Civil Engineering.
SRB FILAMENT WOUND CASE MATERIAL PROPERTY STUDY Final Report
R. Noel Tolbert 15 Apr. 1985 106 p refs
(Contract NAS8-35672)
(NASA-CR-171469; NAS 1.26:171469; TTU-CE-85) Avail: NTIS HC A06/MF A01 CSCL 21H

A procedure was developed and computer codes written for determining the tensile extensional lamina stiffness properties of graphite-epoxy filament wound cylinders. The procedure was based on experimental data taken from cylinder pressure testing, micromechanical theory, and sensitivity analysis. A procedure for developing micromechanical equation coefficients was outlined that permitted tensile extensional stiffness properties to be calculated using theoretical design values. A parallel development was completed for bending that utilized a reduced compression modulus. Comparisons were made of analytical predictions based on theoretical design properties with experimental test results for filament wound cylinders subjected to torsion, pressure, static bending, and dynamic vibrations. Author

N85-27941*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
STRUCTURAL INTEGRITY AND DURABILITY OF REUSABLE SPACE PROPULSION SYSTEMS
Washington May 1985 191 p refs Conf. held in Cleveland, Ohio, 4-5 Jun. 1985; sponsored by NASA, Washington and NASA. Lewis Research Center
(NASA-CP-2381; E-2554; NAS 1.55:2381) Avail: NTIS HC A09/MF A01 CSCL 21H

The space shuttle main engine (SSME), a reusable space propulsion system, is discussed. The advances in high pressure oxygen hydrogen rocket technology are reported to establish the basic technology and to develop new analytical tools for the evaluation in reusable rocket systems. For individual titles, see N85-27942 through N85-27971.

N85-27942*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
OVERVIEW OF AEROTHERMODYNAMIC LOADS DEFINITION STUDY Abstract Only
Louis A. Povinelli *In its* Struct. Integrity and Durability of Reusable Space Propulsion Systems May 1985 p 3-5 refs (For primary document see N85-27941 17-20)
Avail: NTIS HC A09/MF A01 CSCL 21H

The Aerothermodynamic Loads Definition were studied to develop methods to more accurately predict the operating environment in the space shuttle main engine (SSME) components. Development of steady and time-dependent, three-dimensional viscous computer codes and experimental verification and engine diagnostic testing are considered. The steady, nonsteady, and transient operating loads are defined to accurately predict powerhead life. Improvements in the structural durability of the SSME turbine drive systems depends on the knowledge of the

aerothermodynamic behavior of the flow through the preburner, turbine, turnaround duct, gas manifold, and injector post regions. E.A.K.

N85-27943*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
SSME FUEL PREBURNER TWO-DIMENSIONAL ANALYSIS
Thomas J. VanOverbeke *In its* Struct. Integrity and Durability of Reusable Space Propulsion Systems May 1985 p 7-14 (For primary document see N85-27941 17-20)
Avail: NTIS HC A09/MF A01 CSCL 21H

The durability of the SSME turbine is strongly affected by the temperature profile leaving the preburner. A reacting flow computer model to predict the turbine inlet temperature profile was used. Calculations were made by using a reacting flow code, to assess the sensitivity of the turbine inlet temperature profile to variations in the flow entering the SSME preburner. E.A.K.

N85-27944*# Sverdrup Technology, Inc., Middleburg Heights, Ohio.
SSME TURBOPUMP TURBINE COMPUTATIONS Abstract Only
Philip G. E. Jorgenson *In* NASA. Lewis Research Center Struct. Integrity and Durability of Reusable Space Propulsion Systems May 1985 p 15-26 (For primary document see N85-27941 17-20)
Avail: NTIS HC A09/MF A01 CSCL 21H

A two-dimensional viscous code was developed to be used in the prediction of the flow in the SSME high-pressure turbopump blade passages. The rotor viscous code (RVC) employs a four-step Runge-Kutta scheme to solve the two-dimensional, thin-layer Navier-Stokes equations. The Baldwin-Lomax eddy-viscosity model is used for these turbulent flow calculations. A viable method was developed to use the relative exit conditions from an upstream blade row as the inlet conditions to the next blade row. The blade loading diagrams are compared with the meridional values obtained from an in-house quasithree-dimensional inviscid code. Periodic boundary conditions are imposed on a body-fitted C-grid computed by using the GRAPE GRids about Airfoils using Poisson's Equation (GRAPE) code. Total pressure, total temperature, and flow angle are specified at the inlet. The upstream-running Riemann invariant is extrapolated from the interior. Static pressure is specified at the exit such that mass flow is conserved from blade row to blade row, and the conservative variables are extrapolated from the interior. For viscous flows the noslip condition is imposed at the wall. The normal momentum equation gives the pressure at the wall. The density at the wall is obtained from the wall total temperature. E.A.K.

N85-27945*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
SIMULATION OF MULTISTAGE TURBINE FLOWS c34
M. L. Celestina (Sverdrup Technology, Inc., Middleburg Heights, Ohio), R. A. Mulac (Sverdrup Technology, Inc., Middleburg Heights, Ohio), and John J. Adamczyk *In its* Struct. Integrity and Durability of Reusable Space Propulsion Systems May 1985 p 27-36 (For primary document see N85-27941 17-20)
Avail: NTIS HC A09/MF A01 CSCL 20D

The numerical simulation of turbine flows serves to enhance the understanding of the flow phenomena within multistage turbomachinery components. The direct benefit of this activity is improved modeling capability, which can be used to improve component efficiency and durability. A hierarchy of equations was formulated to assess the difficulty in analyzing the flow field within multistage turbomachinery components. The Navier-Stokes equations provides the most complete description. The simplest description is given by a set of equations that govern the quasi-one-dimensional flow. The number of unknowns to be solved for increases monotonically above the number of equations. The development of the additional set of equations needed to mathematically close the system of equations forms the closure problem associated with that level of description. For the Navier-Stokes equation there is no closure problem. For the quasi-one-dimensional equation set random flow fluctuations, unsteady fluctuations, nonaxisymmetric flow variations, and hub-to-shroud variations on the quasi-one-dimensional flow must be accounted for. E.A.K.

N85-27946*# Cleveland State Univ., Ohio.
UNSTEADY FLOW IN MULTISTAGE TURBINES Abstract Only c34
Surya P. Surampudi *In* NASA. Lewis Research Center Struct. Integrity and Durability of Reusable Space Propulsion Systems May 1985 p 37-38 refs (For primary document see N85-27941 17-20)
Avail: NTIS HC A09/MF A01 CSCL 20D

The development of an efficient model for the response of a multistage turbine to either a total pressure or total temperature distortion is discussed. Each turbine blade row is modeled as an actuator disk and is often used to describe the flow through turbine and compressor blade rows. The flow approaching the blade row is assumed to be subsonic and inviscid. The distortion occurs at upstream infinity and is in the form of total pressure or total temperature. A solution was found to unsteady Euler equations by using a finite volume method. With prescribed inlet and boundary conditions flow variables such as density, pressure, and velocities can be calculated at cell centers in the entire flow region. The inlet and exit of the blade row coincide with lines of constant. E.A.K.

N85-27947*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
UNSTEADY HEAT TRANSFER DUE TO TIME-DEPENDENT FREE STREAM VELOCITY Abstract Only c34
Rama S. R. Gorla and Ali Ameri *In* NASA. Lewis Research Center Struct. Integrity and Durability of Reusable Space Propulsion Systems May 1985 p 39-40 refs (For primary document see N85-27941 17-20)
Avail: NTIS HC A09/MF A01 CSCL 20D

The present work was undertaken in order to study the unsteady combined convection from a horizontal circular cylinder to a transverse flow. A coordinate perturbation method is used to transform the governing set of partial differential equations into a system of ordinary differential equations. The free stream time-dependent velocity was assumed to be sinusoidal and the boundary layer response due to both low as well as high frequencies of oscillation will be studied. Currently numerical solutions are being obtained for the distribution of the unsteady Nusselt number and the friction factor. Author

N85-27948*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
NEW FACILITY TO STUDY UNSTEADY WAKE EFFECTS ON TURBINE AIRFOIL HEAT TRANSFER c34
Robert J. Simoneau *In its* Struct. Integrity and Durability of Reusable Space Propulsion Systems May 1985 p 41-47 (For primary document see N85-27941 17-20)
Avail: NTIS HC A09/MF A01 CSCL 20D

A significant portion of the SSME aerothermal loads program is directed at the heat transfer effects of the unsteady flows, particularly wakes, that occur naturally in turbomachinery. Although these phenomena occur in all turbomachines, we feel they will be more severe in the SSME turbines because of the high heat transfer associated with the very high Reynolds numbers over the SSME airfoils. G.L.C.

N85-27949*# Calspan - State Univ. of New York Joint Venture, Buffalo, N.Y.
EXPERIMENTAL MEASUREMENTS AND ANALYSIS OF HEAT TRANSFER AND GAS DYNAMICS IN A ROTATING TURBINE STAGE Abstract Only c34
M. G. Dunn, W. J. Rae, and W. K. George *In* NASA. Lewis Research Center Struct. Integrity and Durability of Reusable Space Propulsion Systems May 1985 p 49-52 refs (For primary document see N85-27941 17-20)
Avail: NTIS HC A09/MF A01 CSCL 20D

The life-cycle fatigue of a particular component of a high-pressure turbine stage is influenced by the local heat flux and the

resulting metal temperature excursions experienced by this component during normal operation. Flow through a turbine stage is seldom uniform and is often influenced by non-uniform incoming gas streams that can result in locally high heat fluxes. In the case of the rotor blades passing through the nozzle guide vane wakes and passages, these local heat rates translate into local temperature fluctuations that will likely affect the fatigue life of the blade. In order to better understand the influence of the heat load on the component life, one would like to have both the local steady-state heat flux and the high-frequency component of the heat flux. G.L.C.

N85-27950*# United Technologies Research Center, East Hartford, Conn.
CALCULATION OF VISCOUS COMPRESSIBLE FLOWS IN SMALL GAS TURBINES Abstract Only c34
O. L. Anderson and G. D. Power *In* NASA. Lewis Research Center Struct. Integrity and Durability of Reusable Space Propulsion Systems May 1985 p 53-57 refs (For primary document see N85-27941 17-20)
Avail: NTIS HC A09/MF A01 CSCL 20D

The NASA Lewis Research Center is conducting a program to develop improved technology for the space shuttle main engine (SSmE). This program requires not only a component test program, but also the development of accurate and reliable analyses to support the program. Thus a computer analysis for the prediction of the flow of hot gases, composed of a variety of exhaust products, through rocket and gas turbine components would support this program and also would be suitable for a wide variety of other applications. G.L.C.

N85-27951*# Argonne National Lab., Ill.
FLOW-INDUCED VIBRATION OF SSME MAIN INJECTOR LIQUID-OXYGEN POSTS Abstract Only c34
S. S. Chen, J. A. Jendrzejczyk, and M. W. Wambsganss *In* NASA. Lewis Research Center Struct. Integrity and Durability of Reusable Space Propulsion Systems May 1985 p 59-61 (For primary document see N85-27941 17-20)
Avail: NTIS HC A09/MF A01 CSCL 20D

The liquid-oxygen (LOX) posts are exposed to hot hydrogen flowing over the tubes on its way to the combustion chamber. Fatigue cracking of some LOX posts was observed after test firing of the SSMEs. A current design modification consists of attaching impingement shields to the LOX posts in the outer row. The modification improved the vibration/fatigue problem of the LOX posts, but resulted in an increased pressure drop that ultimately shortened the life expectancy of other components. A fundamental study of vibration of the LOX posts was initiated to understand the flow-induced vibration problem and to develop techniques to avoid detrimental vibrational effects with the overall objective of improving engine life. This effort, including an assessment of the problem, scoping calculation and experiment, and a work plan for an integrated theoretical/experimental study of the problem is summarized. G.L.C.

N85-27952*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
OVERVIEW OF STRUCTURAL RESPONSE: PROBABILISTIC STRUCTURAL ANALYSIS Abstract Only c39
Christos C. Chamis *In its* Struct. Integrity and Durability of Reusable Space Propulsion Systems May 1985 p 63-66 (For primary document see N85-27941 17-20)
Avail: NTIS HC A09/MF A01 CSCL 20K

Advanced analysis methods are required to predict accurately the structural response (static, transient, cyclic, etc.) and accompanying local stresses in space propulsion system components operating in a fatigue environment consisting of complex thermal and mechanical load spectra. The probabilistic approach to structural response consists of the following program elements: (1) composite load spectra, (2) probabilistic structural analysis methods development, (3) probabilitic finite element theory, (4) probabilistic structural analysis application, (5) structural tailoring of turbopump blades, (6) unified theory of dynamic creep buckling/ratcheting, (7) creep buckling/ratcheting analyzer, and (8) nonlinear COBSTRAN development. Research activities on all of these program elements (except the creep buckling/ratcheting analyzer) are under way. G.L.C.

N85-27953*# Rockwell International Corp., Canoga Park, Calif.
COMPOSITE LOADS SPECTRA FOR SELECT SPACE PROPULSION STRUCTURAL COMPONENTS Abstract Only c39
J. F. Newell *In* NASA. Lewis Research Center Struct. Integrity and Durability of Reusable Space Propulsion Systems May 1985 p 67-75 (For primary document see N85-27941 17-20)
(Contract NAS3-24382)
Avail: NTIS HC A09/MF A01 CSCL 20K

Rocket engine technology continues to demand higher performance with lighter weight components that have man-rated reliability requirements. These requirements have yielded higher operating pressures, temperatures, and transient effects as well as markedly increased mechanical vibration and flow-related loads. The difficulty in installation, cost, and potential for destroying an engine severely limited the required instrumentation and measurements to adequately define loads of key components such as turbine blades. Also, accurate analytical methodologies for defining internal flow-related loads are just emerging for problems typically found in rocket engines. The difficulty of obtained measured data and verified analysis methodologies has led to the probabilistic load definition approach. G.L.C.

N85-27954*# Battelle Columbus Labs., Ohio.
COMPOSITE LOADS SPECTRA FOR SELECT SPACE PROPULSION STRUCTURAL COMPONENTS: PROBABILISTIC LOAD MODEL DEVELOPMENT Abstract Only c39
Robert Kurth *In* NASA. Lewis Research Center Struct. Integrity and Durability of Reusable Space Propulsion Systems May 1985 p 77-83 (For primary document see N85-27941 17-20)
(Contract NAS3-24382)
Avail: NTIS HC A09/MF A01 CSCL 20K

This effort is in support of the development of the expert system of computer codes to predict the loads on select structural components of a space propulsion engine. The development will be based primarily on the space shuttle main engine (SSME) test data base. Because of random variations of the many different sources of the loadings on the selected structural components and transients, a probabilistic approach to the problems was adopted. The goal of this task is to characterize all of the individual sources of loads at critical structural locations, such as the turbine blades, the transfer ducts, and liquid oxygen posts, using state-of-the-art probabilistic methods with varying levels of sophistication. The second phase of this work is the development of a composite load model based on a probabilistic synthesis of the individual load model previously developed. This model will be based on the stochastic combination of the load variables and not on the physical process for the combination of the individual loads to the composite load seen by the selected structural components.R.J.F.

N85-27955*# Southwest Research Inst., San Antonio, Tex.
PROBABILISTIC STRUCTURAL ANALYSIS THEORY DEVELOPMENT Abstract Only c39
O. H. Burnside *In* NASA. Lewis Research Center Struct. Integrity and Durability of Reusable Space Propulsion Systems May 1985 p 85-92 (For primary document see N85-27941 17-20)
(Contract NAS3-24389)
Avail: NTIS HC A09/MF A01 CSCL 20K

The objective of the Probabilistic Structural Analysis Methods (PSAM) project is to develop analysis techniques and computer programs for predicting the probabilistic response of critical structural components for current and future space propulsion systems. This technology will play a central role in establishing system performance and durability. The first year's technical activity is concentrating on probabilistic finite element formulation strategy and code development. Work is also in progress to survey critical materials and space shuttle mian engine components. The probabilistic finite element computer program NESSUS (Numerical Evaluation of Stochastic Structures Under Stress) is being

developed. The final probabilistic code will have, in the general case, the capability of performing nonlinear dynamic of stochastic structures. It is the goal of the approximate methods effort to increase problem solving efficiency relative to finite element methods by using energy methods to generate trial solutions which satisfy the structural boundary conditions. These approximate methods will be less computer intensive relative to the finite element approach. R.J.F.

N85-27956*# MARC Analysis Research Corp., Palo Alto, Calif.
PROBABILISTIC FINITE ELEMENT DEVELOPMENT Abstract Only **c39**
Jop Nagtegaal *In* NASA. Lewis Research Center Struct. Integrity and Durability of Reusable Space Propulsion Systems May 1985 p 93-98 (For primary document see N85-27941 17-20)
(Contract NAS3-24389)
Avail: NTIS HC A09/MF A01 CSCL 20K

The probabilistic finite element computer program known as Numerical Evaluation of Stochastic Structures Under Stress (NESSUS) is being developed for the analysis of critical structural components for reusable space propulsion systems. First year efforts involve the formulation of the probabilistic analysis strategy and the development of a probabilistic linear analysis code. The ultimate goal of the 3-year program is the development of a finite element code capable of performing nonlinear dynamic analysis of structures having stochastic material properties, geometry, and boundary conditions and subjected to random loading. Three levels of sophistication are envisioned for the stochastic description of the structural problem, namely: (1) homogeneous random variable for stiffness, mass, damping, and external loading; (2) stochastic characterization of variables at the element level, with specified interelement correlations; and (3) stochastic interpolation of variables within a finite element. Two alternative probabilistic analysis methods will be developed, allowing for all three levels of modeling sophistication. R.J.F.

N85-27957*# Northwestern Univ., Evanston, Ill.
PROBABILISTIC FINITE ELEMENT: VARIATIONAL THEORY Abstract Only **c39**
T. Belytschko and Wing Kam Liu *In* NASA. Lewis Research Center Struct. Integrity and Durability of Reusable Propulsion Systems May 1985 p 99-107 (For primary document see N85-27941 17-20)
(Grant NAG3-535)
Avail: NTIS HC A09/MF A01 CSCL 20K

The goal of this research is to provide techniques which are cost-effective and enable the engineer to evaluate the effect of uncertainties in complex finite element models. Embedding the probabilistic aspects in a variational formulation is a natural approach. In addition, a variational approach to probabilistic finite elements enables it to be incorporated within standard finite element methodologies. Therefore, once the procedures are developed, they can easily be adapted to existing general purpose programs. Furthermore, the variational basis for these methods enables them to be adapted to a wide variety of structural elements and to provide a consistent basis for incorporating probabilistic features in many aspects of the structural problem. Tasks concluded include the theoretical development of probabilistic variational equations for structural dynamics, the development of efficient numerical algorithms for probabilistic sensitivity displacement and stress analysis, and integration of methodologies into a pilot computer code. R.J.F.

N85-27958*# Sverdrup Technology, Inc., Middleburg Heights, Ohio.
PROBABILISTIC STRUCTURAL ANALYSIS OF SSME TURBOPUMP BLADES: PROBABILISTIC GEOMETRY EFFECTS Abstract Only **c39**
Vinod K. Nagpal *In* NASA. Lewis Research Center Struct. Integrity and Durability of Reusable Propulsion Systems May 1985 p 109-115 (For primary document see N85-27941 17-20)
Avail: NTIS HC A09/MF A01 CSCL 20K

A probabilistic study was initiated to evaluate the precisions of the geometric and material properties tolerances on the structural response of turbopump blades. To complete this study, a number of important probabilistic variables were identified which are conceived to affect the structural response of the blade. In addition, a methodology was developed to statistically quantify the influence of these probabilistic variables in an optimized way. The identified variables include random geometric and material properties perturbations, different loadings and a probabilistic combination of these loadings. Influences of these probabilistic variables are planned to be quantified by evaluating the blade structural response. Studies of the geometric perturbations were conducted for a flat plate geometry as well as for a space shuttle main engine blade geometry using a special purpose code which uses the finite element approach. Analyses indicate that the variances of the perturbations about given mean values have significant influence on the response. R.J.F.

N85-27959*# Georgia Inst. of Tech., Atlanta.
DYNAMIC CREEP BUCKLING: ANALYSIS OF SHELL STRUCTURES SUBJECTED TO TIME-DEPENDENT MECHANICAL AND THERMAL LOADING Abstract Only **c39**
G. J. Simitses, R. L. Carlson, and R. Riff *In* NASA. Lewis Research Center Struct. Integrity and Durability of Reusable Space Propulsion Systems May 1985 p 117-120 (For primary document see N85-27941 17-20)
(Grant NAG3-534)
Avail: NTIS HC A09/MF A01 CSCL 20K

The objective of the present research is to develop a general mathematical model and solution methodologies for analyzing the structural response of thin, metallic shell structures under large transient, cyclic, or static thermomechanical loads. Among the system responses associated with these loads and conditions are thermal buckling, creep buckling, and ratcheting. Thus geometric and material nonlinearities (of high order) can be anticipated and must be considered in developing the mathematical model. A complete, true ab-initio rate theory of kinematics and kinetics for continuum and curved thin structures, without any restriction on the magnitude of the strains or the deformations, was formulated. The time dependence and large strain behavior are incorporated through the introduction of the time rates of metric and curvature in two coordinate systems: fixed (spatial) and convected (material). The relations between the time derivative and the covariant derivative (gradient) were developed for curved space and motion, so the velocity components supply the connection between the equations of motion and the time rates of change of the metric and curvature tensors. R.J.F.

N85-27960*# Sverdrup Technology, Inc., Middleburg Heights, Ohio.
STRUCTURAL TAILORING OF SSME BLADES (VANES) Abstract Only **c39**
R. Rubinstein *In* NASA. Lewis Research Center Struct. Integrity and Durability of Reusable Space Propulsion Systems May 1985 p 121-125 (For primary document see N85-27941 17-20)
Avail: NTIS HC A09/MF A01 CSCL 20K

The engine blade design optimization program STAEBL (Structural Tailoring of Engine Blades) is available at the NASA Lewis computer facility. The analysis capabilities of this program were extended to typical loading conditions for SSME turbopump blades including thermal and pressure loading. Input files for representative SSME blade designs were developed and sample optimization studies for these blades completed. The structural tailoring program combines a general optimization package and a finite element blade analysis package. The analysis package's capabilities include natural frequency, maximum stress, and forced response computation, and fatigue life and flutter analysis. Optimization is performed using the feasible directions method. The current design is modified by perturbing the design variables so that the design constraints are satisfied while the objective function, such as blade weight, is reduced at the maximum rate. The program's geometric design variables include blade thickness distribution, thickness to chord ratios, and root chord. B.W.

N85-27961*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
INTERACTION OF HIGH-CYCLE AND LOW-CYCLE FATIGUE OF HAYNES 188 ALLOY AT 1400 F DEG Abstract Only c39
Peter T. Bizon, Dan J. Thoma, and Gary R. Halford *In its* Struct. Integrity and Durability of Reusable Space Propulsion Systems May 1985 p 129-138 (For primary document see N85-27941 17-20)
Avail: NTIS HC A09/MF A01 CSCL 20K

The interaction of low-cycle fatigue (LCF) and high-cycle fatigue (HCF) was evaluated at the NASA Lewis Research Center on Haynes 188 alloy at 1400 F. Completely reversed, axial-load, strain-controlled fatigue tests were performed to determine the baseline data for this study. Additional specimens for interaction tests were cycled first at a high strain range for various small portions of expected LCF life followed by a step change to a low strain range to failure in HCF. Failure was defined as complete specimen separation. The resultant lives varied between 10 and 5000 cycles for the low-cycle fatigue tests and between 4500 and 3 million for the high-cycle fatigue tests. For the interaction tests the low-cycle-life portion ranged from 30 and 1000 applied cycles while the high-frequency life ranged from 300 and 300,000 cycles to failure. The step change results showed a significant nonlinear interaction in expected life. Application of a small part of the LCF life drastically decreased the available HCF life as compared with what would have been expected by the classical linear damage rule (LDR). B.W.

N85-27962*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
REEXAMINATION OF CUMULATIVE FATIGUE DAMAGE LAWS Abstract Only c39
Gary R. Halford and S. S. Manson (Case Western Reserve Univ.) *In its* Struct. Integrity and Durability of Reusable Space Propulsion Systems May 1985 p 139-145 refs (For primary document see N85-27941 17-20)
Avail: NTIS HC A09/MF A01 CSCL 20K

Treatment of accumulated fatigue damage in materials and structures subjected to a history of nonsimple repetitive loadings has received a large amount of attention in recent years. A method used for the treatment of complex loading is known as linear damage rule. It was recognized that, this method could result in unconservative predictions of material and structural behavior. An intense flurry of activity followed in the pursuit of alternative methods of analysis that would predict behavior more accurately. So many methods were introduced that it became necessary periodically to prepare review papers placing all the new methods into perspective. The current integrated view regarding the state of the art as it applies to this effort is discussed. The more recently proposed cumulative damage life prediction methods are reviewed. The double linear damage rule (DLDR), which has evolved over the past 20 years, is reexamined with the intent of improving its accuracy and applicability to engineering problems. Modifications are introduced to the analytical formulation to achieve greater compatibility between the DLDR and the so-called damage curve approach, which is an alternative continuous representation of the DLDR. B.W.

N85-27963*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
CYCLIC STRUCTURAL ANALYSES OF SSME TURBINE BLADES c39
Albert Kaufman and Jane M. Manderscheid *In its* Struct. Integrity and Durability of Reusable Space Propulsion Systems May 1985 p 147-154 refs (For primary document see N85-27941 17-20)
Avail: NTIS HC A09/MF A01 CSCL 20K

The problems of calculating the structural response of high-temperature space propulsion components such as turbine blades for the fuel turbopump are addressed. The first high-pressure-stage fuel turbine blade (HPFTB) in the liquid-hydrogen turbopump of the space shuttle main engine (SSME) was selected for this study. In the past these blades have cracked in the blade shank region and at the airfoil leading edge adjacent to the platform. To achieve the necessary durability, these blades are currently being cast by using directional solidification. Single-crystal alloys are also being investigated for future SSME applications. The study evaluated the utility of advanced structural analysis methods in assessing the low-cycle fatigue lives of these anisotropic components. The turbine blade airfoil of the high-pressure stage of the SSME fuel turbopump was analyzed because it has a history of rapid crack initiation. B.W.

N85-27964*# Argonne National Lab., Ill.
EFFECTS OF HIGH MEAN STRESS ON HIGH-CYCLE FATIGUE BEHAVIOR OF PWA 1480 Abstract Only c39
Saurin Majumdar, S. D. Antolovich (Georgia Inst. of Tech.), and Walter W. Milligan (Georgia Inst. of Tech.) *In* NASA. Lewis Research Center Struct. Integrity and Durability of Reusable Space Propulsion Systems May 1985 p 155-162 ref Sponsored in part by NASA (For primary document see N85-27941 17-20)
Avail: NTIS HC A09/MF A01 CSCL 20K

PWA 1480 is a potential candidate material for use in the high-pressure fuel turbine blade of the space shuttle main engine. As an engine material it will be subjected to high-cycle fatigue loading superimposed on a high mean stress due to combined centrifugal and thermal loadings. The present paper describes the results obtained in an ongoing program at the Argonne National Laboratory, sponsored by NASA Lewis, to determine the effects of a high mean stress on the high-cycle fatigue behavior of this material. Straight-gauge high-cycle fatigue specimens, 0.2 inch in diameter and with the specimen axis in the [001] direction, were supplied by NASA Lewis. The nominal room temperature yield and ultimate strength of the material were 146 and 154 ksi, respectively. Each specimen was polished with 1-micron diamond paste prior to testing. However, the surface of each specimen contained many pores, some of which were as large as 50 micron. In the initial tests, specimens were subjected to axial-strain-controlled cycles. However, very little cyclic plasticity was observed. B.W.

N85-27965*# Georgia Inst. of Tech., Atlanta.
CONSTITUTIVE CYCLIC DEFORMATION BEHAVIOR IN SINGLE-CRYSTAL AND DIRECTIONALLY SOLIDIFIED SSME HIGH-PRESSURE FUEL TURBOPUMP AIRFOIL MATERIALS Abstract Only c26
Walter W. Milligan, Eric S. Huron, and S. D. Antolovich *In* NASA. Lewis Research Center Struct. Integrity and Durability of Reusable Space Propulsion Systems May 1985 p 163-169 (For primary document see N85-27941 17-20)
Avail: NTIS HC A09/MF A01 CSCL 11F

The major goal of the project is to correlate mechanical properties with microstructural deformation behavior and to develop models for constitutive response under a variety of monotonic and cyclic loading cycles, temperatures, strain levels, strain rates, and environments. Two alloys are being studied as candidate SSME turbine blade materials. The first is PWA 1480, which is a single-crystal alloy whose nominal composition is reported. The second alloy being studied is D.S. Mar-M 246 + Hf. This is a directionally solidified material, and its nominal composition is also reported. The major areas of interest for the two materials will be slightly different. The single-crystal alloy lends itself well to fundamental deformation studies, since resolved shear stresses on slip planes are all known and only one grain is present. The D.S. material presents an excellent opportunity to study the effects of slightly misaligned grains on deformation behavior. The two materials will be studied by using approximately the same test matrix, so a good degree of direct comparison will also be possible. B.W.

N85-27966*# United Technologies of New Mexico, Inc., East Hartford, Conn.
HIGH-THERMAL-GRADIENT SUPERALLOY CRYSTAL GROWTH Abstract Only c26
David D. Pearson, Donald L. Anton, and Anthony F. Giamei *In* NASA. Lewis Research Center Struct. Integrity and Durability of Reusable Space Propulsion Systems May 1985 p 169 (For primary

document see N85-27941 17-20)
Avail: NTIS HC A09/MF A01 CSCL 11F

Single, (001)-oriented crystals of PWA 1480 were processed in alumina/silica shell molds in a laboratory high gradient furnace. The furnace employs a graphite resistance heated element, a radiation baffle, and a water cooled radiation trap below the baffle. All crystals were grown in vacuum (10 torr) and all heat transfer was radiative. The element is constructed with a variable cross section that is tapered just above the baffle to maximize heat input and therefore thermal gradient. A maximum alloy temperature of 1600 C was used. A thermal gradient of 130 deg C/cm was recorded at 1370 C just above the solidus of the PWA 1480 alloys. Crystal bars with 14.4 and 17.5 mm diameters were grown in alumina/silica shell molds. Each crystal was started from a 1.6 mm pencil seed at a rate of 76 mm/hr and slowly accelerated to a rate of 200 mm/hr under computer control. Volume percent porosity and average pore size were measured as functions of distance in representative bars. Low cycle fatigue behavior and stress rupture properties were determined. Author

N85-27967*# Carnegie-Mellon Univ., Pittsburgh, Pa.
ROLE OF HYDROGEN AND STRUCTURE ON CMSX-2 Abstract Only **c26**
C. L. Baker, J. Chene, W. Kromp, H. Pinczolitis, S. M. Bernstein, and J. C. Williams *In* NASA. Lewis Research Center Struct. Integrity and Durability of Reusable Space Propulsion Systems May 1985 p 171-180 (For primary document see N85-27941 17-20)
Avail: NTIS HC A09/MF A01 CSCL 11F

The goal was to characterize and understand the detailed effect of hydrogen on the tensile and fatigue behavior of single crystals of CMSX-2. Specimens were solutionized, air cooled, and then aged in one of two ways. The resultant macro and microstructure included a pronounced dendritic structure with numerous low angle boundaries in the interdendritic region and on the average a high level of porosity with a large variation in size and distribution. Hydrogen permeability and diffusivity in this material was found to be very low at room temperature. Hydrogen concentration studies on thin samples yielded values significantly higher than found for similar charging conditions in nickel and stainless steels. The tensile mechanical properties were found to depend on hydrogen concentration. SEM observations of the brittle subsurface zone revealed a strong correlation between crack initiation sites and voids just beneath the surface. The hollow and solid samples were compared to better understand the influence of increased charged volume on the fatigue behavior. E.R.

N85-27968*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
THIN-FILM SENSORS FOR SPACE PROPULSION TECHNOLOGY Abstract Only **c19**
Walter S. Kim and David R. Englund *In its* Struct. Integrity and Durability of Reusable Space Propulsion Systems May 1985 p 183-188 refs (For primary document see N85-27941 17-20)
Avail: NTIS HC A09/MF A01 CSCL 22B

SSME components such as the turbine blades of the high pressure fuel turbopump are subjected to rapid and extreme thermal transients that contribute to blade cracking and subsequent failure. The objective was to develop thin film sensors for SSME components. The technology established for aircraft gas turbine engines was adopted to the materials and environment encountered in the SSME. Specific goals are to expand the existing thin film sensor technology, to continue developing improved sensor processing techniques, and to test the durability of aircraft gas turbine engine technology in the SSME environment. A thin film sensor laboratory is being installed in a refurbished clean room, and new sputtering and photoresist exposure equipment is being acquired. Existing thin film thermocouple technology in an SSME environment are being tested. Various coatings and their insulating films are being investigated for use in sensor development. E.R.

N85-27969*# Sverdrup Technology, Inc., Middleburg Heights, Ohio.
OPTICAL STRAIN MEASUREMENT SYSTEM DEVELOPMENT Abstract Only **c35**
Christian T. Lant *In* NASA. Lewis Research Center Struct. Integrity and Durability of Reusable Space Propulsion Systems May 1985 p 189-193 ref (For primary document see N85-27941 17-20)
Avail: NTIS HC A09/MF A01 CSCL 14B

Investigations of physical phenomena affecting the durability of SSME components require measurement systems operational in hostile environments. The need for such instrumentation caused the definition and operation of an optical strain measurement system. This optical strain measurement system based on the speckle shift method is being developed. This is a noncontact, automatic method of measuring surface strain in one dimension that corrects for error due to rigid body motion. It provides a gauge length of 1 to 2 mm and allows the region of interest on the test specimen to be mapped point by point. The output is a graphics map of the points inspected on the specimen; data points is stored in quasi-real time. This is the first phase of a multiphase effort in optical strain measurement. The speckle pattern created by the test specimen is interpreted as high order interference fringes resulting from a random diffraction grating, being the natural surface roughness of the specimen. Strain induced on the specimen causes a change in spacing of the surface roughness, which in turn shifts the position of the interference pattern (speckles). E.R.

N85-27970*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
HEAT FLUX SENSOR CALIBRATOR Abstract Only **c19**
Curt H. Liebert *In its* Struct. Integrity and Durability of Reusable Space Propulsion Systems May 1985 p 195-198 refs (For primary document see N85-27941 17-20)
Avail: NTIS HC A09/MF A01 CSCL 22B

The heat flux to space shuttle main engine (SSME) turbopump turbine blades may be as high as 10 to the 7th power. The heat flux causes thermal transients that are of the order of 1 sec as temperature varies from perhaps 1500 K to 100 K. It is suspected that these transients cause durability problems in the turbine blades. To quantitatively evaluate the effect of these transients, heat flux sensors or gauges were developed to obtain data to verify analytical models. The objective is to design and fabricate a system for steady state and transient calibration and durability testing of heat flux sensors for use in SSME turbine blades. The calibrator consists of: (1) the arc lamp, (2) a high speed positioning table for placing standard and special heat flux sensors in the incident beam of radiant heat flux, (3) provision for cooling the blade and special sensors inserted in the blade, (4) a computer for controlling the positioning table, storing electrical output values from sensors, and calculating heat flux from these values, and (5) a pyrometer for measuring sensor surface temperatures. E.R.

N85-27971*# Rockwell International Corp., Canoga Park, Calif.
FEASIBILITY OF MAPPING VELOCITY FLOW FIELDS IN SSME POWERHEAD BY LASER ANEMOMETRY TECHNIQUES Abstract Only **c19**
D. G. Pelaccio, L. K. Sharma, T. V. Ferguson, J. M. Maram, and S. Pinkowski *In* NASA. Lewis Research Center Struct. Integrity and Durability of Reusable Space Propulsion Systems May 1985 p 199 (For primary document see N85-27941 17-20)
(Contract NAS3-24356)
Avail: NTIS HC A09/MF A01 CSCL 22B

Because of the flow environment associated with the SSME powerhead pressure (3000 psia), temperature (1800 R), and mechanical complexity and the high vibration test stand environment, detailed flow measurements are difficult to make. The feasibility of using laser anemometry techniques to map velocity flow fields in an SSME powerhead is studied. In the study three engine powerhead component flow environments: (1) the high pressure fuel turbopump preburner, (2) the fuel turbopump turbine rotor and stator region, and (3) the 180 deg turnaround duct - are being considered. Flow parameters measured by the anemometry techniques are time averaged values of the velocity magnitude

and flow direction, turbulence intensity, velocity component correlation, integral time scale, and turbulence spectrum. E.R.

N85-27972*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
PRIMARY PROPULSION OF ELECTROTHERMAL, ION AND CHEMICAL SYSTEMS FOR SPACE-BASED RADAR ORBIT TRANSFER
Shih-Ying Wang and Peter J. Staiger 1985 16 p refs Presented at 21st Joint Propulsion Conf., Monterey, Calif., 8-10 Jul. 1985; sponsored by AIAA, SAE and ASME
(NASA-TM-87043; E-2603; NAS 1.15:87043) Avail: NTIS HC A02/MF A01 CSCL 21C

An orbit transfer mission concept has been studied for a Space-Based Radar (SBR) where 40 kW required for radar operation is assumed available for orbit transfer propulsion. Arcjet, pulsed electrothermal (PET), ion, and storable chemical systems are considered for the primary propulsion. Transferring two SBR per shuttle flight to 1112 km/60 deg using electrical propulsion systems offers an increased payload at the expense of increased trip time, up to 2000 kg each, which may be critical for survivability. Trade offs between payload mass, transfer time, launch site, inclination, and height of parking orbits are presented. Author

N85-27973# Ogden Air Logistics Center, Hill AFB, Utah. Propellant Analysis Lab.
SURVEILLANCE REPORT. STAGE 1: DISSECTED MOTORS-PROPELLANTS MOTOR NUMBER 0012199, PHASE 15
J. A. Thompson Mar. 1985 161 p
(AD-A153206; MANPA-503(85)) Avail: NTIS HC A08/MF A01 CSCL 21/8

Testing was performed to determine the useful shelf/service life for LGM-30 (Minuteman-3) Stage 1 solid propellant rocket motors. A three year storage program for propellant and components was started in May, 1961. This program was then extended indefinitely to assure that a deterioration in motor physical characteristics could be detected in time to take some corrective actions before the weapon system performance deteriorated below an acceptable level. This report covers solid rocket propellant test data for motor S/N 0012199. Planned dissection of selected motors in the future will provide samples for continued component testing. The data is presented in the form of regression analysis and the trends are projected 24 months beyond the last test date. From the statistical analysis of all data tested to date, significant degradation of the propellant does not appear likely for at least two years past the oldest data point. GRA

23 CHEMISTRY AND MATERIALS (GENERAL)

Includes biochemistry and organic chemistry.

N85-27974# Pacific Northwest Lab., Richland, Wash.
SYSTEMATIC NOMENCLATURE OF THE NITROGEN, OXYGEN AND SULFUR FUNCTIONAL POLYCYCLIC AROMATIC HYDROCARBONS
D. W. Later, C. W. Wright, K. L. Loening, and J. E. Merritt Nov. 1984 22 p refs Presented at 9th Intern. Symp. on Polynucl. Aromatic Hydrocarbons, Columbus, Ohio, 30 Oct. 1984
(Contract DE-AC06-76RL-01830)
(DE85-007426; PNL-SA-12830; CONF-84103225-4) Avail: NTIS HC A02/MF A01

The nomenclature used in the literature for the heterocyclic and exocyclic PAC is often diversified and confusing. Different preferences for naming generic classes and individual heterofunctional PAC are common. An increase in the number of papers presented in the PAH symposium proceedings on N, O and S PAC has prompted a compilation of the key rules of nomenclature for these classes of compounds. A synopsis of the current rules for nomenclature applied to monofunctional N, O, and S PAC as published by the international union of pure and applied chemistry (IUPAC) is presented to clarify and unify nomenclature used in the proceedings of these symposia. The nomenclature methods that are abridged and presented were taken mainly from Sections A, B, and C of the IUPAC rules on nomenclature of organic chemicals. The nomenclature for the nonfunctional PAH is reviewed and is followed by three sections devoted to outlining the key aspects of naming the N, O, and S PAC. DOE

N85-28874# Joint Publications Research Service, Arlington, Va.
ACADEMICIAN OVCHINNIKOV ON FUTURE OF BIOORGANIC CHEMISTRY
Ye. Manchurova and M. Khromchenko *In its* USSR Rept.: Sci. and Technol. Policy (JPRS-UST-85-008) 8 May 1985 p 78-83 Transl. into ENGLISH from Izv. (Moscow), 4 Jan. 1985 p 3 (For primary document see N85-28872 17-81)
Avail: NTIS HC A06/MF A01

24 COMPOSITE MATERIALS

Includes laminates.

N85-27975 Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany). Unternehmensbereich Flugzeuge.
INTEGRAL PROFILE METHOD FOR PRODUCTION OF CARBON FIBER SHEETS [FERTIGUNG INTEGRAL PROFILVERSTAERKTER CFK-SCHALEN]
J. Klenner Nov. 1984 29 p In GERMAN
(MBB/LFA34/CFK/PUB/006) Copyright. Avail: Issuing Activity

Carbon-fiber subassembly structural resistance and applicability are demonstrated by static and dynamic tests. The production techniques and quality control process for economical line production are presented. Carbon fiber use in aircraft primary structures is recommended for weight reduction. Author (ESA)

N85-27976 Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany).
HEAT RESISTANT CARBON FIBER REINFORCED PLASTICS (CFRP) HARDENING EQUIPMENT [TEMPERATURBESTAENDIGE CFK-AUSHAERTEVORRICHTUNG]
K. Ledwa and J. Klenner Nov. 1984 19 p In GERMAN
(MBB/LFA33/CFK/PUB/007) Copyright. Avail: Issuing Activity

Hardening equipment made of CFRP for aircraft structures was tested. Five systems were chosen after a survey of laminating and surface resins. Tests of these systems lead to a production concept for a heat resistant CFRP hardening apparatus for cylindrical integral profile-stiffened fuselage side shells. The production concept is described. The test results meet expectations with respect to quality as well as to costs and throughput time. Temperature resistance, dimensional stability, and surface finishing are excellent; the measured shrinkage is 0.5%. Author (ESA)

N85-27977*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
AN INVESTIGATION OF MOLECULAR STRUCTURE OF COPOLYMERS USING POSITRON ANNIHILATION SPECTROSCOPY
Jag J. Singh, Terry L. St.Clair, William H. Holt, and W. Mock, Jr. May 1985 8 p refs
(NASA-TM-86431; NAS 1.15:86431) Avail: NTIS HC A02/MF A01 CSCL 11D

Positron lifetime measurements were made in copolyimides synthesized from linear 4,4 prime-bis(3,4-dicarboxyphenoxy) diphenylsulfide dianhydride (BDSDA)/4,4 prime-diaminodiphenyl (ODA) and BDSDA/1,3-diaminobenzene (m-phenylene diamine) homopolymers. The probability of positronium formation as well as its subsequent lifetime are lower in the BDSDA/ODA/MPD (50-50) copolyimide, indicating the presence of a transition molecular architecture characterized by higher electron density and stronger bonds which permit both chemical as well as physical entry of water molecules into it. The presence of this transition region imparts unique physical and mechanical properties to the copolyimide. R.J.F.

N85-27978*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
DESIGNING FOR FIBER COMPOSITE STRUCTURAL DURABILITY IN HYGROTHERMOMECHANICAL ENVIRONMENT
Christor C. Chamis 1985 23 p refs Proposed for presentation at the 5th Intern. Conf. on Composite Mater., San Diego, Calif., 30 Jul. - 1 Aug. 1985; sponsored by American Society of Mining Engineers
(NASA-TM-87045; E-2606; NAS 1.15:87045) Avail: NTIS HC A02/MF A01 CSCL 11D

A methodology is described which can be used to design/analyze fiber composite structures subjected to complex hygrothermomechanical environments. This methodology includes composite mechanics and advanced structural analysis methods (finite element). Select examples are described to illustrate the application of the available methodology. The examples include: (1) composite progressive fracture; (2) composite design for high cycle fatigue combined with hot-wet conditions; and (3) general laminate design. E.A.K.

N85-27979# Gordon Research Conferences, Inc., Kingston, R.I.
GORDON RESEARCH CONFERENCE ON COMPOSITES Final Report, 1 Nov. 1983 - 30 Apr. 1984
Richard J. Farris Dec. 1984 24 p Conf. held at Santa Barbara, Calif., 16-20 Jan. 1984
(Contract DAAG29-83-M-0415)
(AD-A152888; ARO-21152.1-MS-CF) Avail: NTIS HC A02/MF A01 CSCL 11/4

The Gordon Research Conference on Composites was held in Santa Barbara, California during the period January 16 to 20, 1984. The conference is an annual Gordon Conference and has been held yearly on the West Coast since its inception in 1975. The conference had as its main purpose or theme, the science and engineering of tough composites. The conferees and speakers represented a good mix of the chemistry, materials science, physics and engineering disciplines which was the original intent. The papers represented were unpublished original works, as required by the conference regulations, and contained considerable new and not yet understood scientific results. GRA

N85-27980# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
SOLUTION TO EIGENVALUE PROBLEMS OF ANTISYMMETRIC CROSS-PLY AND ANTISYMMETRIC ANGLE-PLY LAMINATED PLATES USING AFFINE TRANSFORMATIONS M.S. Thesis
Z. A. Chaudhry Dec. 1984 105 p
(AD-A153040; AFIT/GAE/AA/84D-5) Avail: NTIS HC A06/MF A01 CSCL 13/4

Using affine transformations and suitably recasting the buckling vibration differential equations, the eigenvalue problem of antisymmetric cross-ply and antisymmetric angle-ply laminated rectangular plates has been reduced to a function of two strong material constants, the generalized rigidity ratio, whose range is in the closed interval from 0 to 1, and the ratio of principal lamina stiffness. With the reduction in number of constants an exhaustive parameter study of buckling and vibration solution trends, is possible. The buckling coefficients decrease with decreasing value of generalized rigidity ratio for both antisymmetric cross-ply and antisymmetric angle-ply laminates. For a given aspect ratio, and ratio of principal lamina stiffnesses, the buckling and frequency coefficient for antisymmetric cross-ply laminates vary linearly with the value of the generalized rigidity ratio, so that one may accurately interpolate between the values of the generalized rigidity ratio. The buckling and frequency coefficients increase with increasing F for antisymmetric cross-ply laminates. No such trend could be established for antisymmetric angle-ply laminates. A simple and fairly accurate method has been established for estimating the buckling and vibration coefficients for anti-symmetric cross-ply laminates. GRA

N85-27981# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
STRENGTH AND FAILURE ANALYSIS OF COMPOSITE LAMINATES WITH HOLES AT ROOM AND ELEVATED TEMPERATURES M.S. Thesis
B. U. Malik Dec. 1984 103 p
(AD-A153263; AFIT/GAE/AA/84D-12) Avail: NTIS HC A06/MF A01 CSCL 11/4

The composite material community has been interested in developing a matrix fiber combination which could improve the ability of a laminate in resisting interlaminate fracture impact loading to a greater degree than in the past and, ultimately, improve upon the toughness of the composite material. Recently, a matrix has been manufactured that appears to assist in obtaining these goals. This material is a thermoplastic resin referred to as polyetheretherkeytone (Peek). A review of literature produced very little information related to Gr/Peek. Thus an experimental study reported here-in was conducted to investigate the high temperature strength (tension and compression) of Gr/Peek and Gr/Epoxy laminates with holes. The results were then used to determine the parameters necessary to predict trends incorporating the point stress, average stress failure criteria and the three parameter curve fir criterion. The comparison of predicted and experimental failure stress is shown graphically. The failure modes of Gr/Peek and Gr/Ep are analyzed with the help of electron scanning micrographs. It is seen that an interface degradation exists for Gr/Peek (Polyetheretherkeytone) at higher temperatures. An effect of shear crippling similar to that of Gr/Ep is observed in compression failure of Gr/Peek. GRA

N85-27982# Argonne National Lab., Ill. Materials Science and Technology Div.
FRACTURE TOUGHNESS OF MgCr(SUB)2O(SUB)4-ZrO(SUB)2
J. P. Singh 1985 15 p refs Presented at the 9th Ann. Conf. on Composites and Advan. Ceram. Mater. and Workshop on Testing Methods for Ceram. Matrix Composites, Cocoa Beach, Fla., 20 Jan. 1985
(Contract W-31-109-eng-38)
(DE85-007945; CONF-850122-6) Avail: NTIS HC A02/MF A01

The effect of unstabilized ZrO2 inclusions on the fracture surface energy of MgCr2O4 was studied as a function of ZrO2 content. It was observed that fracture surface energy increases with increasing ZrO2 content and reaches the maximum value of 24.5 J/m(2) at 16.5 vol % ZrO2. This represents an approx. 4-fold increase in the fracture surface energy of MgCr2O4 as a result of ZrO2 inclusions. It is proposed that this improvement results from the energy absorbed by the microcracks formed in the Mgcr2O4 matrix as a result of the tetragonal (YIELDS) monoclinic phase transformation of ZrO2 and the associated volume expansion. DOE

N85-28184# Joint Publications Research Service, Arlington, Va.
FINLAND, SWEDEN COOPERATE IN COMPOSITES RESEARCH
In its West Europe Rept.: Sci. and Technol. (JPRS-WST-84-024) 10 Jul. 1984 p 1-3 Transl. into ENGLISH from Plastforum Scand. (Helsingborg), no. 5, 1984 p 46 (For primary document see N85-28183 17-31)
Avail: NTIS HC A04/MF A01

25 INORGANIC AND PHYSICAL CHEMISTRY

Includes chemical analysis, e.g., chromatography; combustion theory; electrochemistry; and photochemistry.

For related information see also *77 Thermodynamics and Statistical Physics.*

N85-27983*# National Aeronautics and Space Administration, Washington, D. C.
THE PRODUCTION OF COPPER PHTHALOCYANINE AND/OR ITS DERIVATIVES
Tomio Segawa, Katsumi Matsuzaki, Hideo Sawada, Ritsu Ninomiya, and Motokazu Suyama Dec. 1984 21 p Transl. into ENGLISH of Japanese Patent No. 57-25361 (10 Feb. 1982) p 433-440

Transl. by Scientific Translation Service, Santa Barbara, Calif.
(Contract NASw-4004)
(NASA-TM-77629; NAS 1.15:77629) Avail: NTIS HC A02/MF A01 CSCL 07D

This document discusses the production of copper phthalocyanine and/or its derivatives, which are useful for dye pigments. The method described uses urea, a copper compound and/or a catalyst which have been suspended in an inert reaction medium. The copper compound, catalyst and urea fused and the reaction is performed by using the obtained fusion. The advantages of the invention are listed. B.W.

N85-27984*# National Aeronautics and Space Administration, Washington, D. C.
PRESSED BORIDE CATHODES
W. Wolski Apr. 1985 26 p refs Transl. into ENGLISH from Elektron. (Poland), v. 11, no. 4, 1970 p 149-155 Original language document previously announced in IAA as A70-43442 Transl. by The Corporate Word, Inc., Pittsburgh
(Contract NASw-4006)
(NASA-TM-77821; NAS 1.15:77821) Avail: NTIS HC A03/MF A01 CSCL 07D

Results of experimental studies of emission cathodes made from lanthanum, yttrium, and gadolinium hexaborides are presented. Maximum thermal emission was obtained from lanthanum hexaboride electrodes. The hexaboride cathodes operated stably under conditions of large current density power draw, at high voltages and poor vacuum. A microtron electron gun with a lanthanum hexaboride cathode is described. B.W.

N85-27985*# National Aeronautics and Space Administration, Washington, D. C.
THE LOSS OF MATERIAL FROM THE CATHODE OF METAL ARCS
R. Seeliger and H. Wulfhekel May 1985 21 p refs Transl. into ENGLISH from Ann. der Phys. (Leipzig), v. 6, no. 5, 1930 p 87-104 Transl. by Scientific Translation Service, Santa Barbara, Calif.
(Contract NASw-4004)
(NASA-TM-77845; NAS 1.15:77845) Avail: NTIS HC A02/MF A01 CSCL 07D

A study was made of the effect of arc length, cathode thickness, current strength, gas pressure and the chemical nature of the cathode material and filling gases upon the material loss from Cu, Fe, and Ag cathodes in arcs. The results show that the analysis of the phenomenon is complex and the energy balance is difficult to formulate. Author

N85-27986# York Univ., Downsview (Ontario). Dept. of Chemistry.
THE ELECTRONIC SPECTRA OF PHTHALOCYANINE RADICAL ANIONS AND CATIONS
P. C. Minor, M. Gouterman, and A. B. P. Lever Mar. 1985 42 p
(Contract N00014-78-C-0592)
(AD-A152328; TR-34) Avail: NTIS HC A03/MF A01 CSCL 07/4

The oxidation and reduction of metal phthalocyanines give rise to at least six oxidation states whose electronic spectra are rationalized in some depth in terms of SCF energies, Coulomb and exchange integrals. It is shown that a single set of parameters can reproduce the Q band energies moderately well. Furthermore, this same set of energies can reproduce differences in electrochemical potentials observed within this redox set. The pattern of variation in the Q band energies (and in their number) now provides a means for identifying whether it is the metal or the phthalocyanine ligand which is reduced upon addition of an electron to the system. GRA

N85-27987# Rensselaer Polytechnic Inst., Troy, N. Y. Center for Integrated Electronics.
COMPLETELY CONSUMED CARBIDE: A NEW PROCESS FOR DIELECTRIC ISOLATION
W. J. Lu, A. J. Steckl, and T. P. Chow Mar. 1985 12 p
(Contract N00014-81-K-0605)
(AD-A152379; AD-E900434; TR-12) Avail: NTIS HC A02/MF A01 CSCL 07/2

A new process for dielectric isolation based on the use of silicon carbide has been investigated. This process uses the lower oxidation rate of SiC compared to Si to provide local regions of thick field oxide. If the local oxidation process results in the complete consumption of the carbide (C3) film, then a high quality MOS structure is obtained. In this paper, this C3 process is compared to the standard silicon nitride LOCOS process. MOS capacitors and Schottky barrier diodes have been fabricated with both techniques for varying pad oxide thickness (0, 100, 200 A). The effect of high temperature anneal on these structures has been investigated. The electrical properties of these devices have been measured. This includes lifetime, breakdown voltage and I-V characteristics. For the minimum bird's besk case (no pad oxide) the C3 process results in superior electrical properties over the standard nitride process. GRA

N85-27988# Northwestern Univ., Evanston, Ill.
THE DEVELOPMENT OF LASER ANALYTICAL METHODS FOR THE CHARACTERIZATION OF SOLID-LIQUID AND SOLID-HIGH PRESSURE GAS INTERFACES Final Report, 1 Sep. 1979 - 30 Jun. 1983
Y. W. Chung, G. C. Schatz, P. C. Stair, R. P. VanDuyne, and E. Weitz Feb. 1985 56 p
(Contract N00014-79-C-0794)
(AD-A152382; AD-E900434) Avail: NTIS HC A04/MF A01 CSCL 07/4

This report summarizes research in two areas: laser induced thermal desorption at solid/UHV interfaces, and surface enhanced optical spectroscopy at solid/liquid, solid/gas and solid/UHV interfaces. The major accomplishment in the first area was the development of a pulsed laser induced thermal description technique for probing surface desorption and diffusion. In the second area, an apparatus has been constructed which enables the measurement of the surface enhanced Raman and other surface optical spectra in UHV. In addition, surface enhanced spectra were measured for a number of adsorbate/substrate combinations in electrochemical cells, and the theory of surface enhancement effects was elucidated. GRA

N85-27989# Ohio State Univ., Columbus.
RESEARCH ON THE KINETICS OF PHASE CHANGES IN SOLIDS Final Report, 15 Dec. 1984 - 28 Feb. 1985
J. P. Hirth 13 Mar. 1985 10 p
(Contract N00014-75-C-0541)
(AD-A152387) Avail: NTIS HC A02/MF A01 CSCL 07/4

Research on the kinetics of phase transformations is summarized. Topics include nucleation and growth of crystals from the vapor phase, thin film interface structure, diffusional growth of interfacial layers, and displacement reactions at interfaces. GRA

N85-27990# Rensselaer Polytechnic Inst., Troy, N. Y. Dept. of Chemistry.
THE ELECTROCHEMISTRY OF AZINE, OXAZINE AND THIAZINE DYES Final Report
H. H. Richtol and D. A. Aikens 1985 5 p
(Contract N00014-78-C-0494)
(AD-A152394) Avail: NTIS HC A02/MF A01 CSCL 07/4

The role of short-lived intermediates of dyes such as methylene blue safranin-O, neutral red and oxazines used in the photosensitization of electrodes was studied by means of laser flash photolysis and voltammetry. The study includes transients initiated by absorption of light by dyes in solution and by dyes absorbed on electrodes, with major emphasis on the transients arising from solution absorption. For each mode of photoexcitation the identity, the lifetime and the mechanism of formation and decay of the transient species was determined. Key variables examined systematically included pH, solvent composition, electrode material and potential, and reagents which selectively quench the excited state. The goal established the place of formation and the disappearance of each transient species in the overall photoelectrochemical process. GRA

N85-27991# Arnold Engineering Development Center, Arnold Air Force Station, Tenn.
HIGH RESOLUTION SPECTROSCOPY OF C13O16 IN GAS MIXTURES Final Report, Jul. 1983 - Feb. 1984
H. C. Walker, Jr. Mar. 1985 23 p
(AD-A152625; AEDC-TR-85-10) Avail: NTIS HC A02/MF A01 CSCL 07/4

A nonintrusive method of measuring the concentration and temperature of specific molecules in the exhaust stream of rocket and turbine engines is being sought to replace the probe methods currently in use. These current methods provide results which are subject to question because the probe itself may chemically alter the exhaust gas composition. The tunable diode laser (TDL) spectrometer system is being developed as a possible replacement for the probes. In the present report, measurements on the C13O16 isotope of CO at 4.7 micrometers will be described. Measurements of pressure broadening parameters were made on the P(17) and P(16) lines of the (1-0) band of C13O16 using 20-percent CO in nitrogen at temperatures ranging from 300 to 900 K. The C12-O16 broadening of C13O16 was assumed to be the same as C12O16 self broadening in the data analysis, and the nitrogen broadening of C13O16 was measured as a function of temperature. The results, which were taken at various pressures and temperatures, were extrapolated to standard temperature and pressure. A discussion of the pertinent theory, experimental techniques, and results follows. GRA

N85-27992# Naval Postgraduate School, Monterey, Calif.
AN INVESTIGATION INTO THE SOOT PRODUCTION PROCESSES IN A GAS TURBINE ENGINE M.S. Thesis
A. L. Lohman Sep. 1984 52 p
(AD-A152710) Avail: NTIS HC A04/MF A01 CSCL 21/2

This thesis details an investigation into the nature of soot production in a gas turbine combustor. The goal was to obtain axial temperature profiles and soot size distributions inside an Allison T63-A-5A combustor. The present temperature probe and gas sampling apparatus were able to acquire data. Results from these initial tests suggested some preliminary conclusions. First of all, flatter temperature profiles were possibly indicative of fuels with lower aromatic content. Also, soot size along the centerline of the combustor did not appear to change appreciably. Soot itself seemed to be composed of 0.1 micron spherical particles prone to agglomeration. Relatively large, puff-like structures observed on sample collection filters were apparently artifacts of the sampling technique. Several methods of improving the apparatus were suggested. GRA

N85-27993# Ballistic Research Labs., Aberdeen Proving Ground, Md.
MEASUREMENT OF FRANCK-CONDON FACTORS FOR THE v'=0 PROGRESSION IN THE B-X SYSTEM OF PO Final Technical Report
W. R. Anderson, S. W. Bunte, and A. J. Kotlar Dec. 1984 29 p
(DA Proj. 1L1-61102-AH-43)
(AD-A152734; AD-F300598; BRL-TR-2627) Avail: NTIS HC A03/MF A01 CSCL 07/2

Laser Fluorescence of PO produced in a microwave discharge through organophosphonate esters has been studied. The fluorescence was pumped in the B doublet sigma plus - X doublet pi 3250 Angstrom system. Relative intensities of fluorescence for the v prime equals zero progression were measured. These intensities were used to derive Franck-Condon factors for the v prime equals zero progression. GRA

N85-27994# California Univ., Santa Barbara. Dept. of Chemistry.
THE ENHANCEMENT OF MOLECULAR FLUORESCENCE AND PHOTOCHEMISTRY BY SMALL METAL PARTICLES Annual Technical Report
P. Das and H. Metiu Mar. 1985 43 p
(Contract N00014-81-K-0598; Grant NSF CHE-82-06130)
(AD-A152740; AD-E750971; Rept-15) Avail: NTIS HC A03/MF A01 CSCL 07/5

We examine a quantum mechanical model for the enhancement of fluorescence yield and photochemical rates by the presence of small particle capable to sustain electromagnetic resonances. The sphere lowers the absorption and emission efficiency by taking energy from the molecule and storing it into nonradiative modes, enhances the absorption by increasing the local field and enhances the fluorescence by emitting efficiently the energy transferred from the emitting state to a radiative electromagnetic resonance of the particle. The present paper studies how the interplay of these effects modifies fluorescence intensity and the rate of photochemical reactions. Author (GRA)

N85-27995# Georgia Univ., Athens. Dept. of Chemistry.
CHEMICAL APPLICATIONS OF TOPOLOGY AND GROUP THEORY. 17: AN INFORMATION THEORETICAL APPROACH TO POLYHEDRAL SYMMETRY
R. B. King 27 Mar. 1985 18 p
(Contract N00014-84-K-0365)
(AD-A152821; TR-3) Avail: NTIS HC A02/MF A01 CSCL 07/4

Information theoretic parameters are described which measure the asymmetry of polyhedra based on partitions of their vertices, faces, and edges into orbits under action of their symmetry point groups. Such asymmetry parameters are all zero only for the five regular polyhedra and are all unity for polyhedra having no symmetry at all, i.e., belonging to the C sub 1 symmetry point group. In all other cases such asymmetry parameters have values between zero and unity. Values for such asymmetry parameters are given for all topologically distinct polyhedra having five, six, and seven vertices; all topologically distinct eight-vertex polyhedra having at least six symmetry elements; and selected polyhedra having from nine to twelve vertices. Effects on polyhedral distortions on these asymmetry parameters are examined for the tetrahedron, trigonal bipyramid, square pyramid, and octahedron. Such information theoretic asymmetry parameters can be used to order site partitions which are incomparable by the chirality algebra methods of Rush and co-workers. GRA

N85-27996# Colorado Univ., Boulder. Dept. of Chemistry.
GAS PHASE ION-MOLECULE CHEMISTRY OF CARBON, NITROGEN AND OXYGEN COMPOUNDS Final Report, Oct. 1978 - Dec. 1984
C. H. DePuy and V. M. Bierbaum 29 Jan. 1985 12 p
(Contract DAAG29-82-K-0025; Grant DAAG29-79-G-0012)
(AD-A152876; ARO-16004.11-CH; ARO-18667.15-CH; Rept-12) Avail: NTIS HC A02/MF A01 CSCL 07/4

The gas phase reaction of nitrogen, silicon, sulfur and phosphorous organic compounds with anions have been investigated using the flowing afterglow technique. Studies have been made which compare mechanisms by which first and second row elements react with anions. New methods for the generation of specific anions in the gas phase have been developed. A variety of new types of gas phase ions (PH2(-), R5Si(-), C3H2NO2(-), etc.) have been prepared and their chemical reactions studied. GRA

N85-27997# Northwestern Univ., Evanston, Ill. Dept. of Mechanical Engineering.
COMBUSTION AND MICRO-EXPLOSION OF WATER/OIL EMULSIONS IN HIGH PRESSURE ENVIRONMENTS Final Report, 7 Dec. 1981 - 6 Dec. 1984
C. K. Law Feb. 1985 9 p
(Contract DAAG29-82-K-0023)
(AD-A152960; ARO-18428.9-EG) Avail: NTIS HC A02/MF A01 CSCL 21/2

Water/oil emulsions hold potential for soot reduction, multifuel capability, and self-extinguishment upon spillage and incendiary ignition. In view of the fact that most of the fundamental research performed so far were in the normal atmosphere although the potential applications of water/oil emulsions are in such high-pressure combustors as diesel engines and gas turbines, this program was initiated to study the combustion characteristics of water/oil emulsions droplets in a high-temperature, high-pressure, convective environment such that useful guidelines can be identified

for emulsion formulation and engine design. Of particular interest is the exploration of the phenomenon of microexplosion which may be responsible for much of the potential benefits of emulsion utilization. GRA

N85-27998# North Carolina Univ., Chapel Hill. Dept. of Chemistry.
ELECTROCHEMISTRY OF POLYMER FILMS NOT IMMERSED IN SOLUTION: ELECTRON TRANSFER ON AN ION BUDGET
R. W. Murray, J. C. Jernigan, and C. E. D. Chidsey 5 Mar. 1985 7 p
(Contract N00014-82-K-0337)
(AD-A152989; TR-13) Avail: NTIS HC A02/MF A01 CSCL 07/4

Films of poly-(Os(bpy)2(vpy)2)(C104)2 sandwiched between two metallic electrodes can support electron hopping, concentration gradient-driven electron conduction in acetonitrile vapor and in dry N2 gas, when the potential difference delta E between the electrodes is made such as to generate a mixture of Os(3), Os(2), Os(1) states. The latter requirement is dictated by the fixed pool (ion budget) of C10(-)4 counterions in the film. It is significant the C10(-)4 ions can move relatively freely in the dry film, that the apparent Os(3/2) and Os(2/1) format potentials are different for the vapor and dry N2 environments, and that currents through dry polymer films are larger than in vapor exposed films. GRA

N85-27999# Joint Oil Analysis Program, Pensacola, Fla. Technical Support Center.
EVALUATION OF USED CRANKCASE OILS USING COMPUTERIZED INFRARED SPECTROMETRY Final Report, Jan. 1982 - Jun. 1984
B. B. McCaa and J. P. Coates Jun. 1984 150 p
(AD-A152993; AD-E401306; JOAP-TSC-84-01) Avail: NTIS HC A07/MF A01 CSCL 20/6

This is the final report of a study to determine whether computerized infrared spectroscopy is a feasible technique for oil condition monitoring. The study addresses the major factors that influence the performance of a lubricant in service and demonstrate that these factors may be monitored with infrared spectroscopy. The study identifies specific regions and peaks within the infrared spectra to be monitored in a routine oil condition monitoring program and proposes abnormal threshold for quantitative measures of these regions and peaks. Evaluation criteria for five Army combat and tactical vehicle engines and one Air Force administrative engine are developed. Furthermore, the study recommends a field test of the infrared methodology at a single Army installation. Objective 1. Evaluate the effectiveness of the Perkin-Elmer Model 1330, Computerized Infrared Spectrophotometer, as a used oil condition monitoring device. Objective 2. Develop an improved oil condition monitoring methodology based on computerized infrared spectrophotometry. GRA

N85-28000# Joint Oil Analysis Program, Pensacola, Fla. Technical Support Center.
EVALUATION OF USED CRANKCASE OILS USING COMPUTERIZED INFRARED SPECTROMETRY. APPENDICES Final Report, Jan. 1982 - Jun. 1984
B. B. McCaa and J. P. Coates Jun. 1984 470 p
(AD-A152994; AD-E401306; JOAP-TSC-84-01-App) Avail: NTIS HC A20/MF A01 CSCL 20/6

This is the final report of a study to determine whether computerized infrared spectroscopy is a feasible technique for oil condition monitoring. The study addresses the major factors that influence the performance of a lubricant in service and demonstrates that these factors may be monitored with infrared spectroscopy. The study identifies specific regions and peaks within the infrared spectra to be monitored in a routine oil condition monitoring program and proposes abnormal threshold for quantitative measures of these regions and peaks. Evaluation criteria for five Army combat and tactical vehicle engines and one Air Force Administrative engine are developed. Furthermore, the study recommends a field test of the infrared methodology at a single Army installation. This document only includes computer printout with tables and plots. GRA

N85-28001# New Orleans Univ., La. Dept. of Chemistry.
A STUDY OF GAS SOLID REACTIONS USING COATED PIEZOELECTRIC DETECTORS Final Report, 1 Jun. 1981 - 1 Oct. 1984
G. G. Guilbault 1 Jan. 1985 17 p
(Contract DAAG29-81-K-0094)
(AD-A153047; ARO-17654.4-CH) Avail: NTIS HC A02/MF A01 CSCL 07/4

A basic study was conducted to find specific adsorbents for atmospheric pollutants. These pollutants were then placed as coatings on piezoelectric crystals, and these devices were used as detectors for these pollutants. Detectors have been designed for the following compounds at concentrations of ppb-ppm with reproducibilities of better than 3% and detection times of less than 30 sec: (1) organophosphorus compounds, (2) mercury, (3) carbon monoxide, (4) toluene, (5) vinyl chloride, (6) sulfur dioxide, (7) phosgene, (8) isocyanates, (9) acrylonitrile, (10) hydrazine, and (11) formaldehyde. GRA

N85-28002# Ballistic Research Labs., Aberdeen Proving Ground, Md.
PHOTOCHEMICAL IGNITION STUDIES. 1: LASER IGNITION OF FLOWING PREMIXED GASES Final Technical Report
A. W. Miziolek and R. C. Sausa Feb. 1985 29 p
(AD-A153048; AD-F300600; BRL-TR-2644) Avail: NTIS HC A03/MF A01 CSCL 07/5

Gas mixtures of CH4/air, CH4/N2O, C3H8/air, C3H8/N2O, and C2H2/air were ignited above a slot burner by focusing three different laser beams whose wavelengths are 193 nm, 248 nm, and 532 nm. Minimum ignition energies were determined over a wide range of equivalence ratios and over the energy range of 0.1-40 mjoule/pulse for each gas/laser combination. A substantial wavelength dependence of the minimum ignition energy was observed for the ArF (193 nm) and KrF (248 nm) lasers acting on the different gas mixtures and was attributed to molecule-specific multiphoton-induced photochemistry of the various fuel and oxidizer molecules. Here, the necessary radicals and/or ions which are needed to cause ignition to occur are apparently produced in a controlled way. The Nd:YAG second harmonic (532 nm) laser exhibited a much smaller minimum ignition energy range for the various gas mixtures due to a different ignition mechanism involving gas breakdown, i.e., a laser-produced spark. This process appears to be much harder to control with respect to energy deposition than the photochemical one. The most efficient laser-driven ignition system was the one where the ArF (193 nm) laser acted on C2H2/air & laser energies as low as 0.2 mjoule caused ignition. Our results further indicate that there should be a number of ways to improve the efficiency of the photochemical ignition process. Thus, this new type of ignition source appears to possess considerable potential for utility in both practical applications as well as in allowing direct, time-resolved studies of the chemistry of ignition itself, which is an area of considerable current interest. GRA

N85-28003# Northwestern Univ., Evanston, Ill. Dept. of Chemistry.
THE SPECTROSCOPY AND REACTION KINETICS OF COORDINATED UNSATURATED METAL CARBONYLS Annual Report, Oct. 1983 - Oct. 1984
E. Weitz 1 Nov. 1984 5 p
(Grant AF-AFOSR-0372-83)
(AD-A153079; AFOSR-85-0343TR) Avail: NTIS HC A02/MF A01 CSCL 07/4

A program involving the investigation and characterization of reactions of coordinatively unsaturated organometallic species is described. The program emphasizes the measurement of rates of reaction of photolytically produced coordinatively unsaturated species with the parent and rates for cluster formation. Experimental measurements are performed using a time resolved transient absorption apparatus which uses a line tunable CO laser to record

spectra and kinetic information by means of probing absorptions in the CO stretch region of the infrared. Systems that have been investigated include coordinatively unsaturated species generated from the Fe(CO)5, Cr(CO)6 and Mn2(CO)10 parents. The results of experiments with these systems are briefly discussed.
Author (GRA)

N85-28004# University of Southern California, Los Angeles.
ELEMENTARY REACTIONS OF IMPORTANCE IN OXIDATION, COMBUSTION IGNITION AND FLAME INHIBITIONS Final Report, 1 Jan. 1981 - 31 Dec. 1984
S. W. Benson 1 Feb. 1985 8 p
(Contract DAAG29-82-K-0043)
(AD-A153139; ARO-18514.29-CH) Avail: NTIS HC A02/MF A01 CSCL 21/2

The last three years have been very eventful and fruitful in terms of scientific achievement and publication. We began a program of investigating the chemistry and mechanisms associated with cool flames, ignition, combustion and inhibition. Specific topics included: Thermochemistry of Radicals Important in Combustion Process; Theoretical Studies in Kinetics; Experimental Design; and Theory of Ionic Solvation. GRA

N85-28005# Naval Surface Weapons Center, White Oak, Md.
KINETICS OF HYDROLYSIS AND PRODUCTS OF HYDROLYSIS AND PHOTOLYSIS OF TETRYL Final Report, Feb. 1980 - Dec. 1981
E. G. Kayser, N. E. Burlinson, and D. H. Rosenblatt 22 Oct. 1984 24 p
(AD-A153144; NSWC/TR-84-68) Avail: NTIS HC A02/MF A01 CSCL 07/3

This study involved the determination of tetryl hydrolysis kinetics in buffered aqueous solutions at 40, 72, and 85 C, and the identification and quantification of the major products of both light and dark hydrolysis reactions of tetryl. The kinetic data indicated a first order disappearance of tetryl for the buffered aqueous solutions at 40, 72, and 85 C, and a first order dependence on OH(-)ion at 40 C. The environmental hydrolysis (20 C and pH 6.8) half life of tetryl (t1/2 approx. 302 + or - 76 days) could only be estimated for a range of activation energies. The major components isolated from the hydrolysis study included: picrate ion, N-methylpicramide, methylnitramine, nitrate ion, and nitrite ion. Several other compounds were also formed but were not identified. GRA

N85-28006# General Electric Co., Philadelphia, Pa. Re-entry Systems Operation.
STUDY OF SELF-PROPAGATING CONDENSED PHASE REACTIONS TiB(2) SYNTHESIS Final Report, 4 Apr. 1983 - 8 May 1984
P. D. Zavitsanos and J. F. DAndrea Feb. 1985 33 p
(Contract DAAG29-83-C-0017)
(AD-A153198; ARO-20079.1-MS) Avail: NTIS HC A03/MF A01 CSCL 07/4

This effort was undertaken to investigate the basic aspects of the condensed phase titanium-boron reaction leading to the formation of high density and quality TiB2 under self-propagating conditions. Candidate factors for controlling microstructure were addressed and were utilized as variables in series of runs which produced TiB2. The heat of formation of TiB2 was measured directly from the reacting elements in a modified bomb calorimeter; a delta H sub f deg., 298 = -71.81 + or - 1.9 was determined which is sufficient to produce liquid TiB2 under adiabatic conditions. Variations of stoichiometry and particle size of starting powders resulted in microstructure and density differences in the final TiB2 product. GRA

N85-28007# Auburn Univ., Ala.
THE DECOMPOSITION OF GAS PHASE FORMALDEHYDE BY PLASMA DISCHARGE Final Report, 1 Oct. 1983 - 31 Dec. 1984
E. J. Clothiaux 1 Mar. 1985 11 p
(Contract DAAG29-83-K-0178)
(AD-A153202; ARO-21312.1-CH-R) Avail: NTIS HC A02/MF A01 CSCL 07/3

Formaldehyde decomposition in a silent electrical discharge is shown to occur and it is demonstrated that the basis for the decomposition is not oxidation produced by ozone in the plasma. GRA

N85-28008# California Univ., Berkeley. Dept. of Chemistry.
CROSSED MOLECULAR BEAM STUDIES OF THE REACTIONS OF OXYGEN AND FLUORINE ATOMS Annual Report, 1 Jan. - 31 Dec. 1984
Y. T. Lee 20 Mar. 1985 83 p
(Contract N00014-83-K-0069)
(AD-A153302) Avail: NTIS HC A05/MF A01 CSCL 07/4

This annual report describes the primary photodissociation of acetylene (C2H2) and bromoiodomethane (CH2BrI) using a new molecular beam photofragmentation translational spectrometer. The new third generation molecular beam photofragmentation translational spectrometer constructed during the past year is described in detail. This apparatus incorporates many new ideas and allows us to study some of the primary dissociation processes of polyatomic molecules which were not possible in the past. The dissociation of Ch2BrI at 248 and 193 nm is extremely interesting. The competition between C-I and CC-Br bond rupture is the key question, but dissociations at 193 nm also produces IBr products. Secondary photodissociations of primary products were also found to be important. These two systems are carried out partly for the purpose of evaluating the performance of the new molecular beam photofragmentation apparatus. The results clearly show that the performance of the apparatus is as good as our original expectation and that it should be capable of handling molecules with very low vapor pressures; studies of these molecules, such as the nitroamines, are planned. Author (GRA)

N85-28009# Arizona Univ., Tucson. Dept. of Chemistry.
PHOTOIONIZATION MASS SPECTROMETRY WITH VUV HYDROGEN LASER SOURCE Interim Technical Report
T. C. Huth and M. B. Denton 21 Mar. 1985 25 p
(Contract N00014-83-K-0268)
(AD-A153362; TR-39) Avail: NTIS HC A02/MF A01 CSCL 20/6

Results are presented which characterize the VUV H2 laser as a selective ion source for analytical mass spectrometry of easily ionized compounds. The types of compounds ionized below the photon energy of 7.8 eV include many pharmaceuticals and drugs of abuse, such as cocaine, heroin, phencyclidine, methamphetamine, and LSD. H2 laser photoionization has produced parent ions only, for all compounds studied thus far. The selectivity of the threshold photoionization process is very high, as compounds within as little as 0.2 eV above the threshold are completely rejected. Photoactive species can be injected as solutions in appropriate organic solvents, without interference from the solvent. At low levels, ion signals are observed, which are due to acceleration of stray electrons in the ion source. The electrons result from interaction of scattered laser radiation with metal surfaces.
Author (GRA)

N85-28010# California Univ., Livermore. Lawrence Livermore Lab.
DETAILED CHEMICAL KINETIC STUDY OF THE EFFECT OF MOLECULAR STRUCTURE ON AUTOIGNITION OF FUEL-AIR MIXTURES
Charles K. Westbrook and William J. Pitz 1 Nov. 1984 11 p refs Presented at the 189th Natl. Meeting of the American Chemical Society, Miami, Fla., 28 Apr. - 3 May 1985
(Contract W-7405-eng-48)
(DE85-004424; UCRL-91803; CONF-850417-3) Avail: NTIS HC A02/MF A01

A kinetic model is used to simulate the ignition of n-butane, isobutane, and n-pentane in air. Computed results are compared with data from shock tube experiments for the two n-alkanes. Model calculations under conditions of pressure and temperature

encountered in internal combustion engines are reported. The influences of fuel molecular size and structure on autoignition rates are discussed in terms of the site-specific H atom abstraction rates and subsequent fragmentation patterns of the alkyl radicals for each of the fuels. DOE

N85-28011# Aerospace Corp., El Segundo, Calif. Aerophysics Lab.
STUDY OF THE FORMATION OF SULFURIC ACID AEROSOLS
K. Westberg, J. F. Bott, John Coffer, S. Durso, and J. Holloway 25 Feb. 1985 18 p refs
(Contract DE-AC03-80EV-10407)
(DE85-008102; ATR-85(7899)-1) Avail: NTIS HC A02/MF A01

A unique flash-photolysis system was built and is now in operation. The development of tunable diode made it possible to monitor the formation and/or removal of polyatomic molecules with highly selective infrared (IR) adsorption. The novel feature of the present system is the combination of internal multiple-reflection optics, which provide an effective path length of 1 km and a tunable diode laser for the selective and sensitive detection of chemical species. In addition, the large diameter (63.5 cm) of the cell permits the study of polyatomic molecules and radicals under conditions where wall reactions play no role. The flash-photolysis system is described, and preliminary results are given for the rate of the gas-phase reaction between SO3 and H2O. The gas-phase reaction is important in the formation of sulfuric acid aerosols. DOE

N85-28012# UOP, Inc., Des Plaines, Ill.
MICHELLE-DERIVED CATALYSTS FOR EXTENDED SCHULZ-FLORY Technical Progress Report, 1 Oct. 1984 - 31 Dec. 1984
Jan. 1985 48 p refs
(Contract DE-AC22-84PC-70023)
(DE85-005656; DOE/PC-70023/T1) Avail: NTIS HC A03/MF A01

C-73-1-101 iron ammonia synthesis catalyst was reduced in the laboratory with H2 at 450 C, 6000 hr (-1) GHSV for 48 hours. The reduced catalyst was examined with Scanning Transmission Electron Microscope (STEM). Large iron crystallites, > 100A, and a broad size distribution were confirmed. Only metallic iron was detected in the X-ray diffraction analysis. The reduced C-73-1-101 catalyst was tested in the Fischer-Tropsch fixed-bed catalyst testing plant under four sets of reference conditions. Preliminary analyses of these tests are described. The presence of two independent parallel product recovery systems allowed separating the products collected initially during the line-out from those collected at the desired conversion level and also allowed multiple material balance periods in an extended run. The products recovered during the run and the wax retained on the catalyst were later analyzed by gas chromatography mostly to determine the carbon numbers. DOE

N85-28013# Cleveland State Univ., Ohio. Dept. of Chemical Engineering.
CORRELATION OF ZEOLITE ZSM-5 ACID STRENGTH WITH CATALYTIC ACTIVITY AND SELECTIVITY Final Report
D. T. Hayhurst Apr. 1984 30 p refs
(Contract DE-AC22-82PC-51258)
(DE85-005415; DOE/PC-51258/T1) Avail: NTIS HC A03/MF A01

Isosteric heats of ammonia adsorption were determined for several cobalt and cobalt/thorium impregnated H-ZSM-5. Samples were impregnated to the 3, 6 and 9 wt % levels using an incipient wetness technique and either acetone or water for dissolving the metal nitrate salt. The metal impregnation resulted in a lowering of the maximum heat of ammonia adsorption and in a corresponding lowering of the maximum acid site strength. The ammonia adsorption capacity and adsorption heat was unaltered by a reduction of the metal-impregnated samples in hydrogen, indicating that the incipient wetness method leads to cobalt which was most likely ion-exchanged into the zeolite rather than impregnated into the sieve in a reducable form. In addition, the impregnated cobalt caused a slight steric hinderance to the diffusion of n-butane into the metal-loaded zeolite. The use of either water or acetone for dissolving the metal nitrate salt altered the acid-strength distribution. Water was found to lower the acid-site strength to a greater degree than the acetone. DOE

N85-28014# Air Products and Chemicals, Inc., Allentown, Pa.
CATALYST AND REACTOR DEVELOPMENT FOR A LIQUID PHASE FISCHER-TROPSCH PROCESS Quarterly Technical Progress Report, 1 Oct. - 31 Dec. 1983
B. W. Brian, W. E. Carroll, N. Cilen, R. Pierantozzi, and A. F. Nordquist Jan. 1985 41 p refs
(Contract DE-AC22-80PC-30021)
(DE85-005894; DOE/PC-30021/T16) Avail: NTIS HC A03/MF A01

Two major tasks continued in the thirteenth quarter: (1) slurry catalyst development; and (2) slurry reactor design studies. The activity and selectively for diesel fuel products of a proprietary catalyst A were studied. This catalyst was found to produce yields in the diesel fuel region equal to or greater than the Schulz-Flory maximum with low rates of deactivation and good stability during previous extended periods of testing. A phase two extended slurry test of a proprietary catalyst B was completed. Considerable improvement in activity was observed, making this batch nearly four times as active as in the first phase of testing. The selectivity for total, gasoline and diesel, fuels was over 65 wt % in both phases of testing. Results show the importance of metals loading and the need for further development work to optimize the activity and selectivity for diesel fuel of this catalyst. A short term (21 day) slurry test was conducted on another modified catalyst optimized by the gas phase screening program. Parametric gas phase screening tests were conducted on three additional catalysts. DOE

N85-28015# Brookhaven National Lab., Upton, N. Y. Physics Dept.
HIGH RESOLUTION POWDER DIFFRACTION
David E. Cox Jan. 1985 7 p refs Presented at IAEA Conf. on Neutron Scattering in the 90's, Juelich, West Germany, 14-18 Jan. 1985
(Contract DE-AC02-76CH-00016)
(DE85-008287; BNL-36001; IAEA-CN-46/030; CONF-850110-5) Avail: NTIS HC A02/MF A01

In the past decade there has been a dramatic increase in the application of neutron powder diffraction data to structural analysis, particularly in many areas of solid state chemistry and materials research. This increase has been accompanied by the growth of a large user community, and can be attributed mainly to the introduction of the Rietveld technique of refinement. A brief description is given of the capabilities of present day instruments and also the two next-generation instruments nearing completion at the Rutherford Appleton Laboratory and the Institute Laue Langevin. Some representative examples of structural investigations in the area of materials research are listed, with specific reference to the rhombohedral phase of Na-A zeolite, which represents a difficult problem to solve with present day techniques. Emphasis is placed on the importance of a proper description of the peak shapes which accounts for sample effects such as particle size and strain broadening in a physically plausible way rather than by empirical parametrization. DOE

N85-28016# Pennsylvania State Univ., University Park. Dept. of Physics.
VIBRATIONAL SPECTRA OF a-Fe(.78)P(.22) BY INELASTIC NEUTRON SCATTERING
N. Lustig, J. S. Lannin, J. M. Carpenter, M. Arai, and R. Hasegawa Sep. 1984 4 p refs Presented at the 5th Intern. Conf. on Rapidly Quenched Metals, Wuerzburg, West Germany, 3 Sep. 1984 Prepared in cooperation with Argonne National Lab., Ill. and Allied Chemical Corp., Morristown, N.J.
(Contracts DE-AC02-82ER12083; FG02-84ER-45095)
(DE85-008298; CONF-8409107-8) Avail: NTIS HC A02/MF A01

Inelastic neutron scattering spectra, G(E), are reported for the amorphous metal metalloid alloy a-Fe/sub, .78/P/sub .22 and

crystalline counterpart, c-Fe3P. The results indicate similarities in the broadened crystalline and amorphous spectra that are highly supportive of similar short range order. The a-Fe/sub .78/P/sub .22 spectra indicate, however, a substantial softening of low frequency Fe-Fe interactions. The amorphous spectra are in good qualtitative agreement with the theoretical density of states, although a reduction of Fe-Fe and Fe-P interactions are observed. The Fe-Fe band is also found to occur near to that predicted for pure a-Fe. DOE

N85-28017# Case Western Reserve Univ., Cleveland, Ohio. Dept. of Physics.
METHANOL ADSORPTION ON Pt(111)
A. V. Melo, G. S. Chottiner, R. W. Hoffman, and W. E. OGrady Dec. 1984 19 p refs Presented at 31st Natl. Vacuum Symp., Reno, Nev., 3 Dec. 1984 Submitted for publication
(Contract DE-AC02-76CH-00016)
(DE85-006802; BNL-35812; CONF-841218-24) Avail: NTIS HC A02/MF A01

High resolution electron energy loss spectroscopy was used to study the decomposition of methanol on a Pt(111) surface. Several intermediate states in the decomposition are identified by quenching the sample when reactions occur. At 100 K a set of peaks at 800, 1040, 1350, and 2890 cm(-1) indicates the presence of a multilayer molecularly adsorbed methanol. As the sample is warmed to 130 K peaks develop at 1700 and 2780 cm(-1), suggesting the formation of formaldehyde on the surface. With further heating, peaks grow at 1820 and 2560 cm(-1) due to the formation of a formyl species during the decomposition of methanol over Pt(111). Further heating leads to the final conversion of the surface species to adsorbed CO and carbonaceous residues. DOE

N85-28018# National Bureau of Standards, Washington, D.C. National Measurement Lab.
RESONANCE IONIZATION MASS SPECTROMETRY OF CARBON
L. J. Moore, J. D. Fassett, J. C. Travis, T. B. Lucatorto, and C. W. Clark [1984] 18 p refs
(Contract DE-AI05-83ER-60185)
(DE85-009040; DOE/ER-60185/T2) Avail: NTIS HC A02/MF A01

Resonance ionization mass spectrometry (RIMS) for carbon was demonstrated. A two photon resonant, three photon ionization scheme provided large ionization signals from carbon atoms obtained by heating microgram samples of graphite. These results show that elemental carbon vapor can be detected at densities at least as low as 10 to the 7th 1/cu cm, and that given an appropriate atomization method, the direct carbon determination on unprepared solid samples should be feasible. DOE

N85-28019# Midwest Research Inst., Golden, Colo. Solar Energy Research Inst.
EXPERIMENTS ON SORPTION CHARACTERISTICS OF SOLID DESICCANT MATERIALS FOR SOLAR DESICCANT COOLING SYSTEMS
A. A. Pesaran Nov. 1984 9 p refs Presented at the Solar Energy Conf., Knoxville, Tenn., 25 Mar. 1985
(Contract DE-AC02-83CH-10093)
(DE85-000542; SERI/TP-252-2479; CONF-850306-1) Avail: NTIS HC A02/MF A01

A test facility for measuring the sorption properties of candidate solid desiccant materials under dynamic conditions and equilibrium conditions, those experienced during desiccant dehumidifier operation, was constructed. The theory of perturbation chromatography was initially used to measure the equilibrium properties of a desiccant/water-vapor system for the first time. Silica gel, molecular sieve, and gamma-manganese dioxide were tested. The equilibrium capacity estimated by the perturbation chromatography was lower than those available in literature, which suggests that perturbation chromatography may not be applicable to desiccant/water-vapor systems. The perturbation chromatography was replaced with a gravimetric technique, and satisfactory results were obtained for a water-vapor/molecular-sieve system. E.A.K.

N85-28020# Argonne National Lab., Ill. Materials Science and Technology Div.
DIGITAL FILTERS FOR APPLICATION TO DATA ANALYSIS IN ELECTRON ENERGY LOSS SPECTROSCOPY
Nestor J. Zaluzec Jan. 1985 22 p refs Presented at the Ariz. State Univ. Centennial Symp. on High-Resolution Electron Microscopy, Tempe, Ariz., 7-11 Jan. 1985
(Contract W-31-109-eng-38)
(DE85-007932; CONF-850142-3) Avail: NTIS HC A02/MF A01

Characteristics of difference, top-hat, and second-order top-hat digital filters are discussed. The K and L edges in NiO and M shell edge in molybdenum were processed to illustrate the usefulness of these filters in EELS. DOE

N85-28021# Physical Sciences, Inc., Andover, Mass.
EXPERIMENTAL AND THEORETICAL STUDY OF CONDENSATION IN MULTICOMPONENT VAPORS Quarterly Report, 15 Aug. - 14 Nov. 1984
G. Wilemski and M. B. Frish Feb. 1985 18 p refs
(Contract DE-AC02-84ER-13154)
(DE85-009357; DOE/ER-13154/3; QR-3) Avail: NTIS HC A02/MF A01

Construction of the supersonic flow/laser light scattering apparratus is discussed. Calculations of nucleation onset conditions were performed for the n-propanol/water and acetone/water systems using classical theory of binary nucleation. The calculated onset curves agree well with experimental data. The results affirm the general utility and validity of using macroscopic thermodynamic properties, particularly the surface tension, to describe binary nucleation thresholds. Some differences between the results of these calculations and previous results for the methanol/water and ethanol/water systems are discussed. DOE

N85-28022# Notre Dame Univ., Ind. Radiation Lab.
PHOTOCHEMISTRY OF COORDINATION COMPLEXES: THE PHTHALOCYANINES
G. Ferraudi 1985 9 p Presented at the 1st Symp. on Inorganic Chem., Santiago, Chili, 7-11 Jan. 1985
(Contract DE-AC02-76ER-00038)
(DE85-007693; DOE/ER-00038/2655; NDRI-2655; CONF-850156-1) Avail: NTIS HC A02/MF A01

It is possible to relate the thermal and photochemical reactivity of the phthalocyanines to the existence of empty and filled (PI)-orbitals at energies which allow the oxidation and reduction of the macrocycle at moderate potentials. The photochemical reactivity of the phthalocyanines is discussed in terms of the population of reactive charge transfer and n(PI)* (ligand centered) states and electron transfer reactions induced in the quenching of the low lying (PI)(PI)* (ligand centered) states. DOE

N85-28023# Foreign Resources Associates, Fort Collins, Colo.
PROCESS FOR CLARIFICATION OF WATER
Donald Eric Weiss (CSIRO, Australia), Luis Otakar Kolarik (CSIRO, Australia), Anthony John Priestley (CSIRO, Australia), and Nevil James Anderson (CSIRO, Australia) Mar. 1985 9 p Transl. into ENGLISH of Offenlegungsschrift no. 2,841,122 (21 Sep. 1978) Prepared for Rockwell International Corp., Golden, Colo.
(DE85-007864; RFP-Trans-448) Avail: NTIS HC A02/MF A01

A process is described for clarification of water, in which the water is brought into contact with a coagulating and/or adsorption agent consisting of a finely divided mineral or clay mineral having an individual particle size of 10 microns or smaller as well as a thin hydroxylated surface layer with positive zeta potential in the case of highly turbid waters, an even better cleaning action can be achieved if a suitable coagulating agent is added to the water. Aluminum sulfate (alum) is identified as the best agent for this purpose. In contrast to earlier suppositions, it has been found that, at least in some cases, much better coagulation results can be achieved if small quantities of polyelectrolytes are occasionally

added together with alum or other coagulating agents (to the water to be cleaned). DOE

N85-28024# Technische Hogeschool, Delft (Netherlands). Afd. der Luchtvaart- en Riumtevaarttechnik.
POLYNOMIAL APPROACHES FOR THE CHARACTERISTIC VELOCITY AND FLAME TEMPERATURE AS A FUNCTION OF MIXING COMPOUNDING AND PRESSURE FOR THE SYSTEMS PMMA/O2, PMMA/AIR, PE/O2, PE/AIR, PS/O2 AND PS/AIR [POLYNOOM BENADERINGEN VOOR KARAKTERISTIEKE SNELHEID EN VLAM TEMPERATUUR ALS FUNCTIE VAN MENGVERHOUDING EN DRUK VOOR DE SYSTEMEN: PMMA/02, PMMA/LUCHT, PE/02, PE/LUCHT, PS/02, EN PS/LUCHT]
V. A. Kramers, P. A. O. G. Korting, and H. F. R. Schoeyer Jan. 1984 43 p refs In DUTCH Prepared in cooperation with Prins Maurits Laboratory TNO
(VTH-LR-421; PML-1984-C10; SFCC-Publ-11) Avail: NTIS HC A03/MF A01

To determine the efficiency of a solid fuel combustion chamber, a polynomial approach in which the characteristic velocity and flame temperature can be calculated as a function of mixing, compounding and pressure is given. Approaches are given for the combinations: PMMA/O2, PMMA/air, PE/O2, PE/air, PS/O2, PS/air over the mixing compounding range from 0.5 to 50 and the pressure range from 0.2 to 3 MPa. The system of polynomials is determined using a method of orthogonal polynomials and linear interpolation on a large collection of theoretical values.
Author (ESA)

N85-28025# Technische Hogeschool, Eindhoven (Netherlands). Dept. of Chemical Technology.
OHMIC POTENTIAL DROP AND GAS BUBBLE RADIUS DISTRIBUTION IN ALKALINE WATER ELECTROLYSIS
B. E. Bongenaar-Schlenter, L. J. M. Konings, C. J. Meyers, J. H. G. Verbunt, E. Barendrecht, C. J. J. Janssen, W. M. Luyter, and S. J. D. vanStralen 1984 14 p ref
Avail: NTIS HC A02/MF A01

A dimensionless correlation for the ohmic resistance between working electrode and diaphragm in the presence of gas bubbles was derived. The resistance was determined in dependence of KOH-concentration, temperature, pressure, gas to liquid volumetric ratio at the outlet of the cell, nature of the nickel electrode surface and distance between working electrode and diaphragm. The effects of various parameters on the average bubble radius and bubble radius distribution at the outlet of the cell were studied.
Author (ESA)

N85-28026# Technische Hogeschool, Eindhoven (Netherlands). Dept. of Chemical Technology.
OXYGEN EVOLUTION ON NiCo2O4 ELECTRODES
J. G. D. Haenen, W. Visscher, and E. Barendrecht 1983 4 p refs
Avail: NTIS HC A02/MF A01

The effect of the preparation of NiCo2O4 on its performance as an anode in water electrolysis was investigated and the electrocatalytic activity was determined with galvanostatic steady state measurements in 5 N KOH, 25 C. Lowering the temperature of the final heat treatment increases the electrochemical activity of the catalyst. The morphology of the nickel cobalt layer is also influenced by the rate of deposition of the layer. The NiCo2O4 layers are prepared by repeated immersion in the mixted nitrates solution. If the concentration of the dipping solution is decreased the number of coating layers must be increased to obtain the same catalyst loading. A gradual formation leads to a denser structure. The highest activity of porous NiCo2O4 electrode is achieved for thermal decomposition at 300 C. Author (ESA)

26 METALLIC MATERIALS

Includes physical, chemical, and mechanical properties of metals, e.g., corrosion; and metallurgy.

N85-28027 Metals Society, London (England).
WELDABILITY OF MICRO-ALLOY STEELS AS REACTION OF STRUCTURE AND INCLUSIONS
J. Bosansky Nov. 1984 17 p refs Transl. into ENGLISH from Zvaranie, v. 10, 1981 p 299-304
(BLL-BISI-Trans-22196-(9022.06)) Avail: British Library Lending Div., Boston Spa, Engl.; UK £20.50; Overseas $45.00

The weldability of two microalloy steels with simulation of welding cycles was studied. Transmission electron microscopy was used for quantitative analysis of the structure. The opening of inclusions in notches of micropieces was measured, using the electron microscopy. R.J.F.

N85-28028 Metals Society, London (England).
LOCAL HEAT TREATMENT OF WELDED JOINTS OF PIPES AND ROTARY VESSELS
B. Kolodej 31 Jan. 1984 15 p refs Transl. into ENGLISH from Zvaranie (Czechoslovakia), v. 10, 1981 p 309-313
Avail: British Library Lending Div., Boston Spa, Engl.

The effect of the basic parameters of heating on the lowering of residual stresses is discussed. A comparison of Czech and foreign standards and specifications is made, and the necessity of revising the former is emphasized. R.J.F.

N85-28029 Metals Society, London (England).
MECHANICAL PROPERTIES OF POLYCRYSTALLINE ALPA TITANIUM
A. Dziadon Nov. 1983 13 p refs Transl. into ENGLISH from Rudy Metale Niezelazne (Katowice), no. 8, 1982 p 368-371
(BLL-BISI-Trans-21923-(9022.06)) Avail: British Library Lending Div., Boston Spa, Engl.: £14.25; Overseas $33.75

The effects of temperature and grain size on the mechanical properties (creep limit and tensile strength) were investigated. The plastic properties (total and uniform elongation and reduction in area) of polycrystalline alpha titanium are discussed. The tests were executed with titanium containing interstitial admixtures equivalent to 0.4 atomic % of oxygen. E.A.K.

N85-28030 Metals Society, London (England).
PHYSIO-CHEMICAL MECHANISMS OF THE PROCESSES OF THE FORMATION OF GLOBULAR INCLUSIONS IN BALL-BEARING METAL
M. I. Gasik Nov. 1984 11 p refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved. Chern. Met. (USSR), no. 5, 1983 p 10-15
(BLL-BISI-Trans-22235-(9022.06)) Avail: British Library Lending Div., Boston Spa, Engl.: UK £14.25; Overseas $33.75

A physio-chemical approach to an analysis of the conditions of formation of nonmetallic inclusions is explained. This approach has made it possible to recommend, and confirm in practice, a process for manufacturing ball-bearing steel having a controlled content of nonmetallic inclusions and improved service properties. B.W.

N85-28031 Metals Society, London (England).
HIGH-STRENGTH WELDABLE STEEL 03G4N2MAF Sh WITH IMPROVED DUCTILITY
V. N. Nikitin Nov. 1984 11 p refs Transl. into ENGLISH from Stal (USSR), no. 5, 1983 p 74-76
(BLL-BISI-Trans-22233-(9022.06)) Avail: British Library Lending Div., Boston Spa, Engl.: UK £14.25; Overseas $33.75

Trial laboratory and production casts of a new low alloy steel with a minimum 0.2% proof stress of 800 MPa and good ductility and impact strength are described. It is found that the steel can be satisfactorily welded using both manual and mechanized processes. E.A.K.

N85-28032 Metals Society, London (England).
THERMODYNAMIC ANALYSIS OF THE PLASMA NITRIDING OF FERROVANADIUM
M. D. Zharnitskii 16 Feb. 1984 8 p refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved. Chernaya Met. (USSR), no. 5, 1983 p 39-42

(BLL-BISI-Trans-22237-(9022.06)) Avail: British Library Lending Div., Boston Spa, Engl.: £14.25; Overseas $33.75

A thermodynamic analysis was made of the three-phase system consisting of the molten alloy, vanadium nitride and plasma containing nitrogen. A model is obtained and used to analyze data for the nitriding of ferrovanadium in a plasma arc furnace and forecasting nitride compositions and alloy nitrogen contents. E.A.K.

N85-28033 Metals Society, London (England).
FORMING OF COATING PROTECTION SYSTEM: MECHANISM OF PAINT-COATING ANTI-CORROSION PROTECTION OF STEEL
Z. Klenowicz 3 Jan. 1984 11 p refs Transl. into ENGLISH from Ochrona Przed Korozja (Poland), no. 4, 1982 p 89-93
(BLL-BISI-Trans-22081-(9022.06)) Avail: British Library Lending Div., Boston Spa, Engl.: £20.50; Overseas $45.00

Paint coatings to protect steel structures were observed. It is shown that metal corrosion, not the destruction of the paint material, makes corrosion protection unstable, and that thicker coatings offer better protection. E.A.K.

N85-28034 Metals Society, London (England).
CORROSION CHARACTERISTICS OF SOME STEELS PRODUCED THROUGH A SELF-CLEANING ROTATING ELECTRODE
K. Noninski and V. Noninski 3 Jan. 1984 8 p refs Transl. into ENGLISH from Machinostr. (Bulgaria), no. 7, 1982 p 316-319
(BLL-BISI-Trans-22046-(9022.06)) Avail: British Library Lending Div., Boston Spa, Engl.

The effect of continuous mechanical renewal on the corrosion characteristics of some anodic-passivating and self-passivating steels was studied. It is shown that the method of anodic surface renewal by a self-cleaning rotating electrode (SRE) is fully suitable to discover some of the latent features in the corrosion characteristics of steels. E.A.K.

N85-28035 Metals Society, London (England).
THERMOMECHANICAL SOFTENING TREATMENT FOR BEARING AND TOOL STEELS
M. I. Sinelnikov et al 29 Mar. 1984 8 p refs Transl. into ENGLISH from Stal (USSR), no. 8, 1983 p 70-71
(BLL-BISI-Trans-22432-(9022.06)) Avail: British Library Lending Div., Boston Spa, Engl.: £14.25, Overseas $33.75

A new practice for thermomechanical softening involving rolling at relatively low temperatures (800-930 C) and accelerated annealing is discussed. This treatment improves service properties and structure and enables water cooling of bars rolled in the 400 mill to be dispensed with. Author

N85-28036 Metals Society, London (England).
THE INFLUENCE OF MELTING PRACTICE AND OF MICROALLOYING, WITH RARE EARTH METALS AND WITH BORON, ON THE QUALITY OF LOW-CARBON STEEL
V. P. Piskova 26 Apr. 1984 12 p refs Transl. into ENGLISH from Stal (USSR), no. 9, 1983 p 32-35
(BLL-BISI-22467-(9022.06)) Avail: British Library Lending Div., Boston Spa, Engl.: UK £14.25; Overseas $33.75

Microalloying with rare earth metals and boron during casting improves the chemical and physical uniformity of the cast metal. Details are given of the effect of microalloying jointly and separately on the structure and cleaners of 20K steel. The use of boron improves the tensile strength and rare earth metals with boron improve ductility and impact strength. Improvement in the properties of a metallurgical product is achieved by improving the quality of the cast metal, and this is achieved particularly by modification or inoculation and by microalloying. R.J.F.

N85-28037 British Library Lending Div., Boston Spa (England).
MULTI-PHASE CRYSTALLIZATION OF FERROUS ALLOYS
A. I. Yatsenko, N. I. Repina, P. D. Grushko, and K. Yu. Doronkin Feb. 1984 9 p refs Transl. into ENGLISH from Izv. Vysshikh Uchbn. Chernaya Met. (USSR), no. 8, 1983 p 46-49
(BLL-BISI-Trans-22441-(9022.06)) Avail: British Library Lending Div., Boston Spa, Engl.: £14.25; Overseas $33.75

The possibility of peritectic-eutectic transition in ferrous alloys was examined by making structural-morphological analyses of 3-component Fe -C alloys under identical cooling conditions to clarify the multi-phase crystallization mechanism in low-carbon steels. Author

N85-28038 Metals Society, London (England).
X-RAY CRYSTALLOGRAPHY OF STEEL U8 AFTER PULSED LASER HARDENING
I. N. Voronov 9 Apr. 1984 5 p refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved., Chernaya Met. (USSR), no. 8, 1983 p 67-68
(BLL-BISI-22444-(9022.06)) Avail: British Library Lending Div., Boston Spa, Engl.: UK £10.00; Overseas $22.50

The surface zone of U.S steel specimens was assessed. It is found that heat treated with subsequent pulsed laser hardening, absence of decarburization in the hardened layer, and refinement of the martensite substructure by rapid heating/cooling cycles during laser pulsing, promotes high hardness in eutectoid steels. E.A.K.

N85-28039 Metals Society, London (England).
PROPERTIES OF CORROSION RESISTANT STABILIZED FERRITIC STEELS
M. Gutu et al 9 Apr. 1984 16 p Transl. into ENGLISH from Wiad. Hutn. (Poland), no. 2, 1982 p 183-188
(BLL-BISI-Trans-22519-(9022.06)) Avail: British Library Lending Div., Boston Spa, Engl.

The plastic properties of Roumanian quality ferritic stainless steels are described. Results of an examination of melts carried out in the laboratory by restricting the carbon content and with the modification in the contents of stabilizing components and of aluminum are given. Author

N85-28040 Metals Society, London (England).
THERMOMECHANICAL TREATMENT AIMED AT THE PROTECTION OF TYPE 316 STAINLESS STEEL FROM IGC AND IGSCC
K. Kiuchi and T. Kondo Feb. 1984 21 p refs Transl. into ENGLISH from Boshoku Gijutsu (Japan), v. 32, no. 9, 1983 p 503-511
(BLL-BISI-Trans-22498-(9022.06)) Avail: British Library Lending Div., Boston Spa, Engl.: £35.50; Overseas $75.00

A new thermomechanical treatment to protect commercial Type 316 stainless steel from intergranular corrosion and intergranular stress corrosion cracking is examined. Mechanical properties are improved, compared with the alternative of modifying the alloying elements. Author

N85-28041 Metals Society, London (England).
THE CORROSION RESISTANCE OF CHROMIUM-NICKEL STEEL CONTAINING RARE-EARTH METALS
G. N. Asatiani 29 Mar. 1984 10 p refs Transl. into ENGLISH from Stal (USSR), no. 9, 1983 p 77-79
(BLL-BISI-Trans-22477-(9022.06)) Avail: British Library Lending Div., Boston Spa, Engl.: UK £14.25; overseas $33.75

The effects of treating steel outside the furnace with a Ca-Si-Mg alloy containing rare-earth metal (REM) is investigated. Using REM reduces the Cr, Ni and Mo content necessary to ensure high corrosion resistance. Author

N85-28042 Metals Society, London (England).
INOCULATION OF NON-METALLIC INCLUSIONS IN STEEL 17GS
Yu. Ya. Skok, M. B. Movchan, A. A. Alymov, V. V. Senichkin, and S. L. Chirikhina 29 Mar. 1985 17 p refs Transl. into ENGLISH from Stal (USSR), no. 8, 1983 p 63-66
(BLL-BISI-Trans-22431-(9022.06)) Avail: British Library Lending Div., Boston Spa, Engl.: £20.50; overseas $45.00

The nature of the nonmetallic inclusions in open-hearth plate steel 17GS was studied. The steel was inoculated either in the

mould or in the ladle with active elements or with complex alloys containing rare-earth and alkaline earth metals. The effect of ladle treatment of the steel with silico-calcium, on the morphology and composition of the nonmetallic inclusion is discussed. The influence of the ratio between rare earth metals and impurities on the composition of nonmetallic inclusions in the steel is examined.
E.A.K.

N85-28043 Metals Society, London (England).
PREPARATION OF METAL FOR COLD UPSETTING
A. T. Bykadorov 15 Mar. 1984 15 p refs Transl. into ENGLISH from Stal (USSR), no. 7, 1983 p 53-56
(BLL-BISI-Trans-22383-(9022.06)) Avail: British Library Lending Div., Boston Spa, Engl.: £20.50; overseas $45.00

A new method for quantitative estimation of metals for their response to limiting deformation work (ductility) to influences of a metallurgical, physical and processing nature is presented. The method is based on established patterns of change in limiting deformation work with change in the shape of the structural components of the metal prepared for drawing. E.A.K.

N85-28044 British Library Lending Div., Boston Spa (England).
ANTICORROSION PROTECTION OF REINFORCING STEEL IN PRESTRESSED GYPSUM AND ANHYDRITE CONCRETE
T. Karczewska-Buczek and M. Starczewski Nov. 1983 17 p refs Transl. into ENGLISH from Ochr. Przed. Koroz. (Poland), no. 3, 1982 p 53-56
(BLL-BISI-Trans-22079-(9022.06)) Avail: British Library Lending Div., Boston Spa, Engl.: £20.50; overseas $45.00

The effectiveness of asphaltic and rubber-based anti-corrosion coatings for concrete reinforcement bars was examined. Corrosion inhibitors (K2CrO4 and NaNO2) were also tested.
Author

N85-28045 Metals Society, London (England).
THE SYNERGISTIC ACTIONS OF STRESS CORROSION CRACKING AND CORROSION FATIGUE
T. Ishihara Dec. 1984 33 p refs Transl. into ENGLISH from Boshoku Gijutsu (Japan), v. 32, no. 7, 1983 p 385-394
(BLL-BISI-Trans-22334-(9022.06)) Avail: British Library Lending Div., Boston Spa, Engl.: UK £31.75; Overseas $60.00

The synergistic action of stress corrosion cracking and corrosion fatigue was examined. The ruling factors in these phenomena, their respective crack-propagation characteristics and the influence of aggressive and passive environments are considered. Real-life situations and laboratory cases are considered.
E.A.K.

N85-28046 Metals Society, London (England).
CORROSION TEST ON HIGH-ALLOY STEELS
W. M. M. Huijbregts Dec. 1983 27 p Transl. into ENGLISH from Elektrotech. (Berlin), ser. 17, no. 11, 1981 p 663-670
(BLL-BISI-Trans-21627-(9022.06)) Avail: British Library Lending Div., Boston Spa, Engl.: £13.00; overseas $30.00

High-alloy stainless steels are finding wider application in the electrical industry. High grade steels are mostly used in nuclear power stations. Damage, due to corrosion, occurs which can have serious consequences in nuclear plants. It is found that corrosion tests are justified.
E.A.K.

N85-28047 Metals Society, London (England).
IMPROVING THE PROPERTIES OF COPPER AND COPPER ALLOYS THROUGH HEAT TREATMENT AND ALLOYING
V. N. Fjodorov 20 Dec. 1983 14 p Transl. into ENGLISH from Banyasz Kohasz Lapok (Kohasz) (Hungary), v. 115, no. 12, 1982 p 556-560
(BLL-BISI-Trans-21939-(9022.06)) Avail: British Library Lending Div., Boston Spa, Engl.

Metals and their alloys have not yet exhausted their reserves of applications. Now and in the future the development of new alloys and heat treatments carried out under special conditions play a major role in the realization of many new properties. Author

N85-28048 Metals Society, London (England).
EFFECT OF TEXTURE IN STEEL ON THE SUSCEPTIBILITY OF HYDROGEN EMBRITTLEMENT
Zhang Lixin and Li Likwing 20 Dec. 1983 16 p refs Transl. into ENGLISH from Acta Met. Sinica (China), v. 18, no. 4, 1982 p 402-410
(BLL-BISI-Trans-22026-(9022.06)) Avail: British Library Lending Div., Boston Spa, Engl.

The effect of texture on H2 embrittlement directionality in cold-rolled high-purity ferrite stainless steel and super-high-strength steel were studied, embrittlement being evaluated by impact testing.
Author

N85-28049 Metals Society, London (England).
GLASSY METALS: NEW HIGHLY RESISTANT MATERIAL
J. Koritta and J. Chmela 16 Feb. 1984 8 p refs Transl. into ENGLISH from Koroze a Ochrana Materialu (Czechoslovakia), no. 4-5, 1981 p 73-75
(BLL-BISI-Trans-21764-(9022.06)) Avail: British Library Lending Div., Boston Spa, Engl.

In the period 1960 - 1981 extensive investigations into methods for the preparation of glassy metals were carried out to throw more light upon the structure, properties and possible methods of the application of glassy metals in technological practice; thus, several hundred publications are now available about this topic.
Author

N85-28050 Metals Society, London (England).
POWDER-METALLURGY ALLOYS AND STEELS
A. S. Lileev, V. P. Menushenkov, and V. N. Antsiferov 27 Feb. 1984 10 p refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved., Chernaya Met. (USSR), no. 5, 1983 p 77-81 and 83-87
(BLL-BISI-Trans-22239-(9022.06)) Avail: British Library Lending Div., Boston Spa, Engl.

The properties of alloy materials produced by the powder metallurgy route, the first covering microstructure after tempering, and the second the effect of protective atmospheres on powder steel after sintering and heat treatment are discussed.
Author

N85-28051 Metals Society, London (England).
THE STATE OF MARTENSITE AFTER QUENCHING IN A MAGNETIC FIELD
V. A. Blinovskii and V. N. Pustovoit 1 Mar. 1984 9 p refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved., Chernaya Met. (USSR), no. 6, 1983 p 68-71
(BLL-BISI-Trans-22297-(9022.06)) Avail: British Library Lending Div., Boston Spa, Engl.

Normal quenching is compared with quenching in a magnetic field. The latter method has been found by X-ray diffractometry and electron microscopy to amplify the degree of two-phase decomposition of martensite and increase the proportion of stack component in alloys with mixed martensite morphology. The margin of ductility and resistance to brittle fracture are improved.
Author

N85-28052 Metals Society, London (England).
PROPERTIES OF CHROMATE COATINGS FORMED ON ELECTROLYTIC ZINC SUBSTRATES
W. Ciesla 16 Feb. 1984 14 p refs Transl. into ENGLISH from Ochrona Przed Korozja (Poland), no. 6, 1982 p 130-134
(BLL-BISI-Trans-22349-(9022.06)) Avail: British Library Lending Div., Boston Spa, Engl.: £20.50; overseas $45.00

The properties of chromate coatings, factors affecting their corrosion resistance, and other parameters have been reviewed. The corrosion resistance of coatings prepared in several different baths has been experimentally examined and the results presented. It has been found that only one type of coating satisfied the standard requirements of the salt chamber test.
Author

N85-28053 Metals Society, London (England).
INFLUENCE OF HEAT TREATMENT PARAMETERS ON THE PROPERTIES OF INDUCTION HARDENED Ni-Cr-Mo STEELS
B. DeBenedetti, D. Firrao, and G. Gay 16 Feb. 1984 11 p refs Transl. into ENGLISH from La Met. Ital. (Italy), no. 11, 1983

p 729-733 Presented at the 2nd Intern. Conf. on Heat Treatment of Mater. and the 1st Natl. Conf. on Met. Coatings, Florence, 20-24 Sep. 1982
(BLL-BISI-Trans-2499-(9022.06)) Avail: British Library Lending Div., Boston Spa, Engl.: UK £13.00; overseas $30.00

Research was performed with 10 kHz induction-hardening equipment to determine the effects of varying the surface temp. and rate of travel in the progressive hardening of UNI 38 NiCrMo 4 steel test specimens. Similar trials were made with C40 and 38 CrMo 4 steels, to assess the influence of the alloying elements with a practically constant carbon content. Author

N85-28054 Metals Society, London (England).
INFLUENCE OF PRELIMINARY COLD DEFORMATION ON FINENESS OF PEARLITE
V. I. Alimov et al 29 Mar. 1984 5 p Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved. Chern. Met. (USSR), no. 7, 1983 p 156
(BLL-BISI-Trans-22409-(9022.06)) Avail: British Library Lending Div., Boston Spa, Engl.: £10.00; overseas $22.50

A study was made of the fineness of pearlite after heat treatment of predeformed steel. The influence of the degree of preliminary cold deformation on the distance between the pearlite plates was determined, using the carbon replica method on an electron microscope. Author

N85-28055 Metals Society, London (England).
INFLUENCE OF THERMOCHEMICAL TREATMENT ON PROPERTIES OF LOW-CARBON STEEL
L. P. Skuratov, V. K. Yatsimirskii, and Zh. V. Demyanovskaya 15 Mar. 1984 5 p refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Chernaya Met. (USSR), no. 7, 1983 p 156-157
(BLL-BISI-Trans-22410-(9022.06)) Avail: British Library Lending Div., Boston Spa, Engl.: £10.00; overseas $22.50

An investigation was made of the properties of low-carbon structural steel in conditions of exposure to high-temperature and aggressive gaseous media. Creep tests were conducted on specimens after thermochemical treatment at 500 C for 2 hours in the different media. Results indicate that the nature of failure of specimens depends on the deformation rate and the hardness of the material. Author

N85-28056 Metals Society, London (England).
NEW PROCESS FOR PRODUCTION OF BIMETAL WITH CORROSION-RESISTANT CLADDING LAYER
B. E. Paton, Yu. A. Sterenbogen, N. A. Mosendz, V. M. Kukik, I. D. Nagaevskii, and A. V. Zarechenskii 15 Mar. 1984 7 p refs Transl. into ENGLISH from Stal (USSR), no. 7, 1983 p 16-17
(BLL-BISI-Trans-22371-(9022.06)) Avail: British Library Lending Div., Boston Spa, Engl.: £14.25; overseas $33.75

An examination was made of a technology using electroslag heating for the production of bimetallic semiproducts with a corrosion-resistant cladding layer. The results of tests indicate that the bonding strength of the layers of bimetal produced by the given method meets with the standard requirements. Author

N85-28057 Metals Society, London (England).
OBTAINING AMORPHOUS COATINGS OF FeW AND Fe-Cr-P-B ALLOYS USING LASER SPUTTERING
N. V. Edneral et al Jan. 1984 4 p refs Transl. into ENGLISH from Izv. Vysshikh Uchebn. Zavedenii, Chernaya Met. (Moscow), no. 9, 1983 p 136-137
(BLL-BISI-22493-(9022.06)) Avail: British Library Lending Div., Boston Spa, Engl.: £10.00; overseas $22.50

A description is given of trials using an intermittent pulse laser to spray Fe50W50 and Fe70Cr10P13B7 alloys on the KCL surfaces to obtain amorphous coatings. The trials proved to be successful. Author

N85-28058 Metals Society, London (England).
THE BEHAVIOUR OF NITRIDE INCLUSIONS IN NICKEL-BASE ALLOYS
G. I. Doronin 15 Mar. 1984 7 p refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved., Chernaya Met. (USSR), no. 7, 1983 p 44-46
(BLL-BISI-Trans-22396-(9022.06)) Avail: British Library Lending Div., Boston Spa, Engl.: UK£10.00; overseas $22.50

Metal was deposited from KhN73MBTu alloy electrodes and the linear dimensions of the nitride inclusions measured, and the number of them calculated, for the electrode waste ends and the ingots. Further research in which electrode metal droplets were rolled down to thin foil, also quenched on a massive steel base, were carried out. The amounts of titanium nitrides present was greatly reduced owing to the high cooling rates, the reduction taking place in the droplet formation stage. Author

N85-28059 Metals Society, London (England).
STAINLESS STEELS: APPLICATION AND WELDING
J. Varriot 16 Feb. 1984 11 p ref Transl. into ENGLISH from Souder (France), Mar. 1980 p 47-51
(BLL-BISI-Trans-22357-(9022.06)) Avail: British Library Lending Div., Boston Spa, Engl.: UK £13.00; overseas $30.00

The mechanical properties of austenitic ferritic stainless steels with an average ferrite content of the order of 35 to 60% and its application and weldability are examined. E.A.K.

N85-28060 Metals Society, London (England).
SINTERING AND PROPERTIES OF METAL-CERAMIC ALLOYS OF THE KOVAR TYPE
M. Nikolov 16 Feb. 1984 9 p ref Transl. into ENGLISH from Metalurgiya (Sofia), no. 11, 1982 p 14-16
(BLL-BISI-Trans-21822-(9022.06)) Avail: British Library Lending Div., Boston Spa, Engl.: UK £14.25; overseas $33.75

The possibilities for producting products of the Kovar type by powder metallurgy methods are explored. The influence of the technological parameters on the sintering thermal coefficient of linear expansion and other physico-mechanical characteristics of the final product is examined. B.W.

N85-28061 Metals Society, London (England).
STEELS WITH IMPROVED MACHINABILITY
I. Annovazzi Jan. 1984 18 p Transl. into ENGLISH from Metall. Ital. (Italy), no. 6, 1983 p 385-390, 393
(BLL-BISI-22341-(9022.06)) Avail: British Library Lending Div., Boston Spa, Engl.: £13.00; overseas $30.00

This paper examines steels with improved machinability, their properties and the mechanisms which contribute to improved machinability. Besides the more traditional improved machinability steels, the characteristics of the new family of boron steels are described. Author

N85-28062 Metals Society, London (England).
THE STRUCTURE OF CARBON MARTENSITE ANALYZED WITH MOESSBAUER SPECTRA
Yu. A. Krupin and M. A. Shtremel 29 Mar. 1984 12 p refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved., Chernaya Met. (USSR), no. 7, 1983 p 88-93
(BLL-BISI-Trans-22402-(9022.06)) Avail: British Library Lending Div., Boston Spa, Engl.: UK£20.50; overseas $45.00

The structure of carbon martensite was analyzed by Mossbauer spectra. The spectrum components are placed in four groups. Relationships of field to carbon concentration are compiled. The data are interpreted by the same grouping system using relative line intensities. E.A.K.

N85-28063 Metals Society, London (England).
TEXTURAL TRANSFORMATIONS TAKING PLACE DURING HEAT AND MECHANICAL TREATMENT IN TRIPLEX STEELS
M. L. Berstein et al Jan. 1984 10 p refs Transl. into ENGLISH from Izv. Vysshikh Uchebn. Zavedenii, Chernaya Met. (Moscow), no. 7, 1983 p 98-102
(BLL-BISI-Trans-22404-(9022.06)) Avail: British Library Lending Div., Boston Spa, Engl.: £20.50; overseas $45.00

Two grades of steel were subjected to different combinations of austenitizing, hot, warm and cold rolling, and cooling. The textures formed were studied, and the various texture orientations

recorded are given and discussed comprehensively. The conclusion is that the special features of the texture transformations taking place in triplex steels during heat and mechanical treatment are associated with the fact that particular variants of the Kurdyumov-Sachs orientation relationships take the most prominent part in the gamma yields alpha-transformation. When cooling martensite is formed, only one or two variants of the orientation relationships are realized. Author

N85-28064 Metals Society, London (England).
MICROSTRUCTURE AND MECHANICAL PROPERTIES OF RARE-EARTHS-MICROALLOYED HIGH-SPEED TOOL STEEL
K. Erinin and R. Maldjieva 24 Jan. 1985 9 p refs Transl. into ENGLISH from Met. (Sofia), no. 10, 1982 p 4-6
(BLL-BISI-Trans-22043-(9022.06)) Avail: British Library Lending Div., Boston Spa, Engl.

In order to determine the influence of rare earths (RE) additions on the structure and properties of cast and forged high-speed tool steel, samples cut from cast, forged and annealed semi-finished products for milling machines of the following steel grades were studied: R6M5 (GOST 19265-73) and M43 (under AISI) - R2M9K8 (ON 04.70224-79) of 95 x 18 mm dimensions. Author

N85-28065 Metals Society, London (England).
PHYSICAL PROPERTIES OF STEELS AND THEIR TEMPERATURE DEPENDENCE
F. Richter 24 Jan. 1984 56 p refs Transl. into ENGLISH from Stahleisen-Sonderber. (West Germany), no. 10, 1983
(BLL-BISI-Trans-22285-(9022.06)) Avail: British Library Lending Div., Boston Spa, Engl.

Results from measurements made over the period 1966 to 1982 were used and evaluated for the compilation of a material data sheet. This material data sheet covers a large number of technically important steels. The publication is intended to fill the gaps and clarify occasional contradictions in the different data sheet and in DIN standards. R.J.F.

N85-28066 Metals Society, London (England).
STUDY ON MECHANISM OF SURFACE DEFORMATION INDUCED BY STRESS CORROSION CRACKING
Z. Baiwei and L. Shuqing 20 Dec. 1983 13 p refs
(BLL-BISI-Trans-21896-(9022.06)) Avail: British Library Lending Div., Boston Spa, Engl.

Stress corrosion cracking (SCC) experiments were conducted with steel D6AC (sigma sub b = 203.5 kgf/sq m) and 24CrMnSiNi (sigma sub b = 161 kgf/sq m) by dropping water onto the crack opening orifice. The phenomenon of surface deformation induced by SCC was observed with optical and interference microscopes. G.L.C

N85-28067 Metals Society, London (England).
EFFECTS OF THE PHASE COMPOSITIONS OF CAST LOW-PEARLITE STEELS MICRO-ALLOYED WITH VANADIUM AND TITANIUM OF THEIR STRUCTURE AND PROPERTIES
L. I. Benshtein et al 15 Mar. 1984 9 p refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved. Chern. Met. (USSR), no. 6, 1983 p 89-92
(BLL-BISI-Trans-22301-(9022.06)) Avail: British Library Lending Div., Boston Spa, Engl.

The effects of different steel compositions and heat treatments on their structures are discussed. The effects on the mechanical properties are given. The strengthening effect of vanadium is increased by additional alloying with titanium. E.A.K.

N85-28068 Metals Society, London (England).
INFLUENCE OF STRUCTURAL STATE AND ALLOY CONTENT OF AUSTENITE ON FORMATION OF MARTENSITIC PHASES IN STEELS
L. I. Lusak et al 15 Mar. 1984 14 p refs Transl. into ENGLISH from Stal (USSR), no. 7, 1983 p 58-61
(BLL-BISI-Trans-22385-(9022.06)) Avail: British Library Lending Div., Boston Spa, Engl.

The results of some studies on the influence of chemical composition and structural state of the initial face centred cubic austenite lattice on formation of various martensitic phases in iron base alloys is reviewed. The structural state of the parent austenite considerably influences martensitic transformation characteristics (martensite crystalline structure, the amount of martensite formed and its formation temperature). The increase in the degree of tetragonality (c/a ratio) of the alpha,-martensite lattice in Fe-Al-C alloys results from an increase in the number of sub-micro-regions with an ordered f.c.c. lattice in the austenite. Aluminum and carbon promote atomic ordering and change the alpha-martensite lattice and also other aspects of gamma yield alpha-martensite transformation. Author

N85-28069 Metals Society, London (England).
THE CHARACTERISTIC STRUCTURE OF WELD METAL OF HIGH TEMPERATURE ALLOY X20CrMoV 121
K. Kussmaul et al 3 Jan. 1984 16 p refs Transl. into ENGLISH from Arch. Eisenhuttenwes (West Germany), v. 52, no. 11, 1981 p 445-450
(BLL-BISI-Trans-21623-(9022.06)) Avail: British Library Lending Div., Boston Spa, Engl.

Metallographic investigations have been carried out on test welds. In particular, the effect has been examined of a second tempering treatment and of a long term annealing treatment (at 550 C) on a weld metal structure identical with the metal X20CrMov 121. Author

N85-28070 Metals Society, London (England).
EFFECT OF THE AGRESSIVE ACTION OF SOIL ON METALLIC PIPELINES. NEW POSSIBILITIES FOR THE PASSIVE AND ACTIVE CORROSION PROTECTION
P. Pickelmann 31 Jan. 1984 13 p Transl. into ENGLISH of conf. paper presented at W.A.T., 1980 Conf. held in Aachen, 1980
(BLL-BISI-Trans-21630-(9022.06)) Avail: British Library Lending Div., Boston Spa, Engl.

The effect of the agressive action of soil on buried metallic pipelines is discussed. New possibilities for the passive and active corrosion protection are covered. Information is given on pipes made of iron and steel covered with a variety of protective coatings. R.J.F.

N85-28071 Metals Society, London (England).
INFLUENCE OF MANGANESE AND HEAT TREATMENT ON STRUCTURE AND PROPERTIES OF Fe-0.1 PERCENT-C-14 PERCENT Cr-BASED STEELS
L. S. Malinov and A. P. Cheilyakh 1 Apr. 1985 9 p refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved. Chern. Met. (USSR), no. 6, 1983 p 83-86
(BLL-BISI-Trans-22299-(9022.06)) Avail: British Library Lending Div., Boston Spa, Engl.

Steels with 0.09-0.1% C, 13.6-14.0% Cr, 0.019-0.030% Si, 0.030-0.045% Al and 0.03-7.8% Mn, the remainder being iron and incidental impurities were studied. With increasing manganese, delta ferrite disappears from the structure and the critical points for direct and reversible austenite martensite transformation are lowered. G.L.C.

N85-28072 Metals Society, London (England).
PART PLAYED BY NON-METALLIC INCLUSIONS DURING DEFORMATION AND FRACTURE OF STEEL WITH DIFFERENT GRAIN SIZES
L. I. Gladshtein, T. N. Rivanenok, and A. V. Rudchenko 20 Dec. 1983 21 p refs Transl. into ENGLISH from Stal (USSR), no. 6, 1983 p 63-68
(BLL-BISI-Trans-22321-(9022.06)) Avail: British Library Lending Div., Boston Spa, Engl.

The influence of sulfur content and non-metallic inclusions on deformation and fracture behavior of steels with different grain sizes produced in two laboratory casts by different deoxidation practices was studied. Increasing contents of sulfur and non-metallics in manganese-bearing steels leads to a decrease in ductile

fracture parameters which is more marked in fine-grained than in coarse-grained steel. R.J.F.

N85-28073 Metals Society, London (England).
INFLUENCE OF EUTECTIC SILICATE INCLUSIONS ON MICRO-PROCESSES DURING DEFORMATION AND FRACTURE OF 12GS STEEL
S. I. Gubenko 20 Dec. 1984 8 p refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved. Chern. Met. (USSR), no. 6, 1983 p 59-61
(BLL-BISI-Trans-22296-(9022.06)) Avail: British Library Lending Div., Boston Spa, Engl.

The behavior of MnO, SiO2-FeO.SiO2 silicate eutectic during plastic deformation of 12GS steel at various temperatures by compressive straining under vacuum at 25 to 1250 C was studied. G.L.C.

N85-28074 Metals Society, London (England).
EXAMINATION OF STEELS BY CHEMICAL ANALYSIS FOR QUALITY ASSURANCE
K. H. Koch 20 Dec. 1984 11 p refs Transl. into ENGLISH from Stahl Eisen (West Germany), v. 103, no. 9, 1983 p 449-452
(BLL-BISI-Trans-22068-(9022.06)) Avail: British Library Lending Div., Boston Spa, Engl.

Chemical analysis provides data on the composition of steels. This report reviews the special tasks and importance of chemical analysis as part of quality assurance, laying special stress on measures necessary to ensure reproducible analysis results. B.W.

N85-28075 Metals Society, London (England).
THE EFFECT OF MICROALLOYING WITH CALCIUM AND MAGNESIUM ON THE PLASTICITY OF POLDI AKN 20 NI-BASED ALLOY
F. Kuncl et al Dec. 1983 12 p refs Transl. into ENGLISH from Hutn. Listy (Czechoslovakia), no. 6, 1982 p 398-400
(BLL-BISI-Trans-2174-(9022.06)) Avail: British Library Lending Div., Boston Spa, Engl.

The AKN 20 alloy is studied for the effect that calcium and magnesium has on its plasticity. The behavior of the alloy shows a lack of hardening properties. This is probably due to an increased susceptibility of the steel to deoxidizing conditions while the alloy is being manufactured. The problem is discussed and a mathematical statistical study and experimental validation of the composition most suited for plasticity are outlined. E.R.

N85-28076 Metals Society, London (England).
OBTAINING OXIDE FILMS ON SURFACE OF TUBES OF CHROMIUM-NICKEL STEELS
L. V. Boukh et al Feb. 1984 8 p refs Transl. into ENGLISH from Stal (USSR), no. 9, 1983 p 81-82
(BLL-BISI-Trans-22478-(9022.06)) Avail: British Library Lending Div., Boston Spa, Engl.

An investigation was made to find a treatment for corrosion-resistant Cr-Ni steel tubes, which would remove surface impurities while forming an oxide film. Acid solutions of potassium dichromate and chromic acid were investigated. Optimum solutions are proposed. R.J.F.

N85-28077 Metals Society, London (England).
USE OF PRINCIPLE OF LOCAL EQUILIBRIUM FOR ASSESSING DIFFUSIONAL SUPERSATURATION DURING SOLIDIFICATION OF ALLOYS
I. A. Sundyrev Feb. 1984 9 p refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved. Chern. Met. (USSR), no. 9, 1983 p 84-87
(BLL-BISI-Trans-22487-(9022.06)) Avail: British Library Lending Div., Boston Spa, Engl.

A physio-chemical examination is made of the process of solidification of a binary alloy in steady-state conditions, based on the thermodynamics of heterogeneous chemical reactions and the principle of local equilibrium during solidification in diffusion conditions. The dependence of diffusional supersaturation on the physical properties of the components of binary alloys, the rate of movement of the solidification front, and the conditions of mass transfer at its boundaries was established. The equilibrium coefficients of distribution and the physio-chemical properties of binary alloys can be forecast on the basis of the dependence of diffusional supersaturation on the mutual position of the base metal and the alloying element in the periodic table of elements. Author

N85-28078 Metals Society, London (England).
INFLUENCE OF PRELIMINARY THERMOMECHANICAL TREATMENT ON DEPTH AND HARDNESS OF NITRIDED LAYERS
M. V. Minkov, M. L. Bernshtein, G. S. Andreeva, and V. N. Blinov Feb. 1984 7 p refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved. Chern. Met. (USSR), no. 9, 1983 p 95-97
(BLL-BISI-Trans-22488-(9022.06)) Avail: British Library Lending Div., Boston Spa, Engl.

Nitrided engineering steels 30Kh3MF1 and 30Kh2MYuA were studied in standard hardened and tempered (initial) conditions and after various schedules of thermomechanical treatment involving cold and hot rolling. Preliminary thermomechanical treatment leads to enhanced nitrided case depth and higher surface hardness. The maximum effect is obtained after high temperature thermomechanical treatment with deformations of about 50%, which leads to formation of a developed and thermally stable polygonized substructure with acceleration of nitrogen diffusion along polygonized subboundaries. R.J.F.

N85-28079 Metals Society, London (England).
NEW METHOD OF CALCULATING THE ECONOMIC EFFECTS OF CORROSION
M. Blaut et al 16 Feb. 1984 13 p refs Transl. into ENGLISH from Ochr. Przed. Koroz. (Poland), no. 6, 1982 p 127-130
(BLL-BISI-Trans-22348-(9022.06)) Avail: British Library Lending Div., Boston Spa, Engl.

A classification system of factors influencing the economic effects of corrosion is proposed. The equations applicable for calculation of both direct and indirect corrosion losses and investment costs for anticorrosion protection are given. Author

N85-28080 Metals Society, London (England).
PRODUCTION AND COMPACTION OF AMORPHOUS METAL POWDERS
V. M. Arkhangelskii, V. A. Vasilev, B. S. Mitin, and A. A. Skuridin 15 Mar. 1984 8 p Transl. into ENGLISH from Stal (USSR), no. 7, 1983 p 69-71
(BLL-BISI-Trans-22387-(9022.06)) Avail: British Library Lending Div., Boston Spa, Engl.

Technology for producing amorphous metal fibers and powders of different shape by high-speed solidification of the melt (HSM) is outlined; a layer of melt solidifies rapidly on the edge of a heat-removing disc rotating in a vertical plane and partly immersed in the melt. A study was made of the influence of the rate of rotation of the disc on the thickness and structure of materials. G.L.C.

N85-28081 Metals Society, London (England).
DISPERSION-STRENGTHENED POWDER-METALLURGICAL CHROMIUM STEELS
Zh. I. Dzneladze et al 15 Mar. 1984 19 p refs Transl. into ENGLISH from Stal (USSR), no. 6, 1983 p 74-79
(BLL-BISI-Trans-22323-(9022.06)) Avail: British Library Lending Div., Boston Spa, Engl.

A technology which enables a dispersion-strengthened steel with 12 to 13% Cr, elevated heat-resistance properties and good corrosion resistance to be obtained by powder metallurgy is described. Sound choice of the matrix and the dispersed strengthening phase is required. Partial reaction of TiO2 with the matrix occurs during production and this promotes formation of dispersed excess-phase particles that make an additional contribution to strengthening. E.A.K.

N85-28082 Metals Society, London (England).
METALLURGICAL MEANS OF PREVENTING THE CORROSION OF METAL

S. A. Golovanenko and E. A. Ulyanin Jan. 1984 6 p refs Transl. into ENGLISH from Stal. (USSR), no. 6, 1983 p 60-61
(BLL-BISI-Trans-22320-(9022.06)) Avail: British Library Lending Div., Boston Spa, Engl.

After stating that the use of stainless steel is the most effective way of reducing corrosion of structures, it was pointed out that the reserves of the alloying elements and additives required for these steels are steadily being exhausted. Various substitutes, including super-ferrites, have been suggested. Anti-corrosion coatings have been investigated, also diffusion metallizing. Author

N85-28083# Metals Society, London (England).
EFFECTS OF THE COOLING RATE ON THE STRUCTURE OF THE GRAPHITE IN INOCULATED IRONS
V. N. Nosov Dec. 1983 10 p Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved. Chern. Met. (USSR), no. 6, 1983 p 104-107
(BLL-BISI-Trans-22305-(9022.06)) Avail: British Library Lending Div., Boston Spa, Engl.

In order to produce iron containing vermicular graphite, different amounts of different inoculants were tried, with the cast specimens cooled at different rates and with different cast specimen thicknesses. It has been found that the desired results are obtained using either of two standard inoculants with small amounts of aluminum or titanium added. Author

N85-28084 Metals Society, London (England).
KINETICS OF THE FORMATION OF A COMPLEX ALLOYED BORIDE COATING ON IRON AND ITS PROPERTIES
V. D. Koskov Dec. 1983 9 p refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved. Chern. Met. (USSR), no. 6, 1983 p 96-99
(BLL-BISI-Trans-22303-(9022.06)) Copyright. Avail: British Library Lending Div., Boston Spa, Engl.

The effects of the diffusional annealing temperature and time on the physical and mechanical properties of complex alloyed nickel boride coatings were investigated. The formation and compositions of coatings are described. When annealed under the optimum conditions the coatings are tough, with no microcracks, and contain sufficiently hard boride phase. E.A.K.

N85-28085 Metals Society, London (England).
PREVENTING THE FORMATION OF AN ANOMALOUS STRUCTURE IN CHEMICALLY SEALED LOW CARBON STEEL
I. D. Zaidman Jan. 1984 14 p refs Transl. into ENGLISH from Stal. (USSR), no. 7, 1983 p 22-25
(BLL-BISI-Trans-22373-(9022.06)) Copyright. Avail: British Library Lending Div., Boston Spa, Engl.

The chemical sealing of low carbon rimming steel with aluminum in the ingot mould reduces the development of segregation processes in the ingot and thus improves uniformity but in the subsurface layers of annealed cold rolled sheet of this type of steel, nonuniformity appears in the form of a so called anomalous structure. This formation of bands of anomalous structure of the first order and bands of the second order occurs as a result of the action of aluminum nitride. The zones enriched with aluminum in the upper part of the ingot are formed during crystallization and the saturation of these zones with nitrogen occurs during the annealing of the sheet as a result of its diffusion from the inner layers of the metal. The appearance of bands of anomalous structure in sheets of chemically sealed steel is prevented by avoiding the formation, in the ingot, of zones enriched with aluminum and by suppressing the process of the saturation of the zones with nitrogen. Author

N85-28086 Department of the Air Force, Washington, D.C.
TITANIUM METAL-MATRIX COMPOSITES Patent
P. R. Smith and F. H. Froes, inventors (to Air Force) Issued 12 Feb. 1985 3 p Supersedes AD-D010242
(AD-D011643; US-Patent-4,499,156; US-Patent-Appl-SN-477793; US-Patent-Class-428-614) Avail: US Patent and Trademark Office CSCL 11/6

Titanium alloy composites having substantially reduced reaction zones are provided which comprise a high strength/high stiffness filament such as silicon carbide, silicon carbide-coated boron, boron carbide-coated boron and silicon-coated silicon carbide, embedded in a fine-grained titanium alloy containing at least 40 percent beta phase, less than 7 percent Al and having a beta-transus temperature below 175 F. (955 C). Also provided is a method for fabricating titanium composites which comprises mechanically working a desired titanium alloy to obtain sheetstock in a desired thickness and having a relatively fine grain size, laying up a preform and consolidating the preform under increased temperature and pressure, wherein consolidation is carried out at a temperature below the beta-transus temperature of the alloy, thereby reducing the amount of reaction zone between the filament and the alloy matrix. GRA

N85-28087# Northwestern Univ., Evanston, Ill. Dept. of Materials Science.
X-RAY DIFFRACTION STUDY OF CHANGES IN STRESS-STRAIN DISTRIBUTIONS DURING FATIGUE OF A 2-PHASE ALLOY
I. C. Noyan and J. B. Cohen Feb. 1985 29 p
(Contract N00014-80-C-0116)
(AD-A152367; AD-E900434; TR-17) Avail: NTIS HC A03/MF A01 CSCL 11/6

In annealed two-phase brass, push-pull fatigue at loads near the endurance limit produces residual stresses only in the softer majority alpha phase, not in Beta. These stresses are balanced between undeformed alpha-phase regions, and a small fraction of deformed alpha; the Beta phase is not involved in this balance. The uniform deformation produced by peening becomes inhomogeneous during fatigue, especially in the softer alpha-phase. This inhomogeneity of deformation is greater after fatigue of the peened specimens, then after fatigue of annealed material. GRA

N85-28088# Northwestern Univ., Evanston, Ill. Dept. of Materials Science.
AN X-RAY DIFFRACTION STUDY OF THE RESIDUAL STRESS-STRAIN DISTRIBUTION IN SHOT-PEENED 2-PHASE BRASS
I. C. Noyan and J. B. Cohen Jan. 1985 50 p
(Contract N00014-80-C-0116)
(AD-A152418; TR-16) Avail: NTIS HC A03/MF A01 CSCL 11/6

X-ray residual stress determination and line broadening analysis were used to study the deformation distributions existing in the surface layers of a shot-peened two-phase brass specimen. The results indicate inhomogeneous partitioning of the plastic strains between the alphabeta-strains, as well as between the surface layers and the bulk. The microstresses, which occur due to differential deformation between alpha and beta strains, have a maximum in the beta-grains at the material surface, while the macro-residual stresses, which arise due to differential plastic deformation between the surface and the bulk, exhibit a maximum deeper in the material. A qualitative model (describing these residual stress profiles in terms of the plastic strains caused by the peening operation) is presented. GRA

N85-28089# Army Armament Research and Development Command, Watervliet, N. Y. Large Caliber Weapon Systems Lab.
THERMAL EXPANSION EFFECTS IN ELECTRICAL TRANSPORT IN AMORPHOUS METALS Final Report
L. V. Meisel and P. J. Cote Feb. 1985 30 p
(AD-A152477; AD-E440273; ARLCB-TR-85005) Avail: NTIS HC A03/MF A01 CSCL 20/13

Theoretical treatments of electrical transport in amorphous metals are usually performed at constant volume, although most experimental studies are performed at constant pressure. Recent studies of the influence of pressure on the electrical resistivity of a variety of amorphous metals indicate that thermal expansion effects can not be ignored in a theoretical description of the temperature dependence of the isobaric resistivity. In this report, general ideas pertinent to a theoretical description of non-isochoric electrical transport are presented. Results for isobaric electrical transport based on the Gruneisen theory of thermal expansion,

which are independent of the model employed to treat isochoric transport, are also given. The implications of the theory are illustrated in the context of the diffraction model by: (1) detailed results specific to the well-characterized low resistivity alloy, a-Mg7Zn3; and (2) a selection of model calculations incorporating thermal expansion effects for cases with positive and negative pressure coefficients of resistivity. GRA

N85-28090# Hughes Aircraft Co., Torrance, Calif. Electron Dynamics Div.

CONTINUED DEVELOPMENT AND TESTING OF TUNGSTEN CONTROLLED POROSITY DISPENSER CATHODES Final Report

Feb. 1985 44 p

(Contract N00014-81-C-2245)

(AD-A152595; EDD-W-09514) Avail: NTIS HC A03/MF A01 CSCL 11/6

The objective of this effort was to continue the development and testing of Tungsten CPD Cathodes. The results of the effort were to produce cathodes with emission levels approximately equivalent or better than those of standard metal matrix B-type cathodes but with the demonstrated advantages of uniform emission and long life. The use of chemical vapor deposition (CVD) has been successfully demonstrated, and units are currently under life test. Laser drilling techniques have been developed so that planar and spherically contoured cathode surfaces can be produced. Although laser drilling may not be perfect, it is the most expedient technique and the only one proven to be able to produce the objectives of 5 micron holes on 15 micron centers in 25 micron thick tungsten. All cathodes placed on life test in this and the prior contract will be continued on life test per contract requirements. GRA

N85-28091# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.

OVERLOAD EFFECTS ON SUSTAINED LOAD CRACK GROWTH AT ELEVATED TEMPERATURE M.S. Thesis

K. E. Harms Dec. 1984 178 p

(AF Proj. 2302)

(AD-A153223; AFIT/GAE/AA/84D-8) Avail: NTIS HC A09/MF A01 CSCL 11/6

This theses investigates the crack growth behavior of Inconel 718 effected by over-loads at elevated temperature. A cumulative damage model was developed to predict the total time-to-failure. Predictions were noted to improve at higher values of stress intensities. All tests were conducted under sustained loading with isothermal conditions of 650 C. Precracked compact tension specimens were used to establish a data base for baseline and overload conditions. The delay time associated with crack growth retardation was determined by comparing the baseline behavior with the results of the overload specimens. The effects of 20-and 50-percent overloads of 1 minute or 1 hour duration were investigated. The shape of the crack tip plastic zone and, hence, the retardation effect was found to be independent of overload duration. The retardation delay time was found to be dependent upon the overload magnitude and the value of K at which the overload was removed. It was also found that a sudden crack advancement occurred when the overload was applied. The above factors were accounted for in the model development. The model was generally capable of predicting the time-to-failure within about 10 percent of the actual material behavior. GRA

N85-28092# Argonne National Lab., Ill. Materials Science and Technology Div.

IN SITU HVEM STUDIES OF ELECTRON BEAM-DRIVEN COMPOSITION CHANGES IN THIN FILM ALLOYS: DISPLACEMENT-RATE GRADIENT EFFECTS

P. R. Okamoto and N. Q. Lam Jan. 1985 7 p refs Presented at the Mater. Res. Soc. Ann. Meeting, Boston, 26-30 Nov. 1984

(Contract W-31-109-eng-38)

(DE85-007992; CONF-841157-85) Avail: NTIS HC A02/MF A01

In-situ high voltage electron microscopy (HVEM) observations showed that the highly focused electron beams normally employed for HVEM irradiation experiments can cause large chemical composition changes in the irradiated zone of thin film alloys (Ni-Al) during elevated temperature irradiations. The driving force for the process comes primarily from the radial gradients in displacement rates generated by the beam. Hence, the rate of change in composition exhibits a strong dependence not only on the temperature and beam intensity, but also on the spatial characteristics of the beam profile. This dependence on beam shape and size poses previously unrecognized problems, particularly for HVEM studies of the effects of dose rate on radiation induced phenomena that are sensitive to alloy composition. Moveover, composition changes driven by radial gradients in the displacement rate occur at increasingly rapid rates as the beam diameter is reduced. Hence, at higher voltages, beam induced composition changes occurring during analysis may become a serious problem, even at relatively low temperatures, for microchemical analysis techniques, such as EDX and EELS, which employ far smaller diameter electron beams than those used for irradiation purposes in the HVEM. DOE

N85-28093# Oak Ridge National Lab., Tenn. Metals and Ceramics Div.

THE DISORDERING PROCESS IN AN L12 ORDERED ALLOY

J. A. Horton, A. DasGupta, and C. T. Liu 1984 9 p refs Presented at Mater. Res. Soc. Ann. Meeting, Boston, 26 Nov. 1984

(Contract DE-AC05-84OR-21400)

(DE85-008152; CONF-841157-86) Avail: NTIS HC A02/MF A01

The antiphase boundary (APB) structure and the disordering process were studied by transmission electron microscopy (TEM) in a long range order and alloy with L12 structure and composition (Ni70Fe30)3(V58Al40Ti2). With an increase in temperature from a single phase field into a two phase field, disordering occurs both homogeneously within ordered domains and heterogeneously along APBs. Disordering continues by a ripening process with the disordered islands shrinking while the disordered bands on the prior APBs grow. The APBs are partially aligned on (100) while the material is single phase. As disordering proceeds, the degree of alignment of the disordered bands on (100) increases until complete alignment results. A correlation of the APB structure with room temperature mechanical properties indicates no dramatic change at the transition to the two phase structure. DOE

N85-28094# Hanford Engineering Development Lab., Richland, Wash.

INFLUENCE OF COMPOSITION ON THE MICROSTRUCTURAL EVOLUTION AND MECHANICAL PROPERTIES OF IRRADIATED Fe-Ni-Cr TERNARIES

H. R. Brager, F. A. Garner, and M. L. Hamilton Oct. 1984 15 p refs Presented at the 1st Intern. Conf. on Fusion Reactor Mater., Tokyo, 3-6 Dec. 1984

(Contract DE-AC06-76FF-02170)

(DE85-007462; HEdL-SA-3175-FP; CONF-841246-22) Avail: NTIS HC A02/MF A01

Five simple Fe-Ni-Cr ternary alloys in the Invar compositional region were irradiated as tensile specimens in EBR-II at 395, 450 and 550 C to 10.5 to 12.5 dpa. The density changes were measured by an immersion density technique. Specimens irradiated at 450 C were examined by electron microscopy and identical specimens were tensile tested at 450 C. Swelling exhibited a dependence on nickel and chromium content that was consistent with the results of earlier studies. The compositional dependence of swelling arises primarily from the dependence on nickel of both vacancy diffusivity and radiation-induced phase decomposition. There is also a small dependence of Frank loop and dislocation evolution on composition. Although there was excellent agreement between the measured strength and a prediction based on observed microstructure for an alloy containing 25% nickel, an increasing disparity developed between the two for alloys with higher nickel levels. This disparity is thought to be related to the hardening associated with the spinodal-like decomposition of the alloy matrix. DOE

N85-28095# Brookhaven National Lab., Upton, N. Y. Dept. of Nuclear Energy.

PROPERTIES OF NITROGEN CONTAINING STAINLESS ALLOY DESIGNED FOR HIGH RESISTANCE TO PITTING
R. Bandy and D. vanRooyen 1984 14 p refs Presented at the NACE Corrosion Intern. Forum and Exhibition, New Orleans, 1 Apr. 1984
(Contract DE-AC02-76CH-00016)
(DE85-008282; BNL-35933; CONF-840405-15) Avail: NTIS HC A02/MF A01

The following properties of the recently developed high nitrogen bearing, highly corrosion resistant stainless steel are described: (1) tensile properties, (2) stress corrosion characteristics in boiling magnesium chloride solution, (3) effect of sensitizing heat treatment on the nature and extent of grain boundary attack; and (4) electrochemical polarization behavior in sulfuric acid and low pH chloride solutions. DOE

N85-28096# Westinghouse Research and Development Center, Pittsburgh, Pa.
STUDY TO OPTIMIZE Cr-Mo STEELS TO RESIST HYDROGEN AND TEMPER EMBRITTLEMENT Final Report, 17 Aug. 1978 - 16 Aug. 1983
B. J. Shaw 1 Oct. 1984 170 p refs
(Contract DE-AC05-78ET-13513)
(DE85-005492; DOE/ET-13513/1) Avail: NTIS HC A08/MF A01

In the first phase, test methods for the evaluation of low strength Cr-Mo steels for hydrogen embrittlement (HE) susceptibility were evolved. A number of commercial steel samples tempered to a range of strength levels were tested in H2S + water vapor. The heat effected zones adjacent to welds were also assessed for HE. The second phase was designed to establish the role of composition (Mo, CR, Mn, Si, C and P) at two strength levels on HE and TE (temper embrittlement) using a statistical design with 32 samples. This phase included the determination of tensile data and a full characterization of carbides found in the steels. A rapid technique for evaluating carbides on the scanning transmission electron microscope via a carbide composition map was developed. The regression analyses yielded expressions for the threshold stress intensity and temper embrittlement in terms of the primary variables but in many instances it was found that better models could be obtained in terms of quasi-independent variables such as the carbides or mechanical properties. DOE

N85-28097# California Univ., Berkeley. Lawrence Berkeley Lab. Materials and Molecular Research Div.
MECHANICAL STABILIZATION OF AUSTENITE AGAINST EPSILON MARTENSITE AND ITS EFFECT ON DEFORMATION BEHAVIOR IN HIGH MANGANESE STEELS
Y. Tomota and J. W. Morris, Jr. Apr. 1984 7 p refs Presented at the 107th Iron and Steel Inst. of Japan, Narashino, Japan, 1-3 Apr. 1984
(Contract DE-AC03-76SF-00098)
(DE85-007654; LBL-18891; CONF-8404235-3) Avail: NTIS HC A02/MF A01

In Fe-17 and 25% Mn binary alloys, ausforming is found to be very effective in stabilizing austenite, although the influence of grain size (austenitizing temperature) on the amount of epsilon at RT is small. Ausforming consists of dislocation introduction above the epsilon/sub D/ temperature by rolling. The influence of epsilon-formation on flow curves of the austenite strengthened by dislocations (ausformed) is different from that of the solution-treated plate. DOE

N85-28098# California Univ., Berkeley. Lawrence Berkeley Lab. Materials and Molecular Research Div.
TEMPERATURE AND MANGANESE CONTENT DEPENDENCES OF TENSILE DEFORMATION IN IRON-HIGH MANGANESE BINARY ALLOYS
Y. Tomota (Ibaraki Univ., Hitachi, Japan) and J. W. Morris, Jr. Apr. 1984 6 p refs Presented at the 107th Iron and Steel Inst. of Japan, Narashino, Japan, 1-3 Apr. 1984
(Contract DE-AC03-76SF-00098)
(DE85-007656; LBL-18890; CONF-8404235-2) Avail: NTIS HC A02/MF A01

Microstructures in the Fe-Mn system depend strongly on Mn Content. The mechanical properties of these alloys were examined by several workers, but many obscure points have remained and are not well understood. The microstructural dependence of the tensile properties of 16 to 36 wt % Mn steels are identified. DOE

N85-28099# Massachusetts Inst. of Tech., Cambridge.
ELECTRONS AND GRAIN BOUNDARY ENERGIES IN METALS
J. Ferrante, J. R. Smith, R. W. Balluffi, and A. Brokman Mar. 1985 15 p refs
(Contract DE-FG02-84ER-45116)
(DE85-009530; DOE/ER-45116/5) Avail: NTIS HC A02/MF A01

Differences between electron density profiles in grain boundaries and those in the crystal yield relatively large electronic contributions to grain boundary energies. These electronic effects can be combined self-consistently with pair-wise interactions in a practical method for computing grain boundary structures and energies. DOE

N85-28100# California Univ., Berkeley. Lawrence Berkeley Lab. Materials and Molecular Research Div.
EROSION OF CORROSION-RESISTANT SURFACE TREATMENTS ON ALLOY STEELS
Alan Levy and Greg Hickey Jan. 1985 45 p refs Presented at the 4th Intern. Conf. on Wear of Mater., Vancouver, British Columbia, 14-18 Apr. 1985
(Contract DE-AC03-76SF-00098)
(DE85-008446; LB-18255; CONF-850415-2) Avail: NTIS HC A03/MF A01

Protective coatings of both diffused and sprayed on types are being used to protect chemical process plant and boiler combustor surfaces from elevated temperature corrosion. An investigation was conducted to determine the small, solid-particle erosion behavior of such coatings at room and elevated temperatures. It was determined that no single coating performed in a superior manner to the others and that hardness was not a factor in establishing erosion resistance. The erosion rates decreased from 20 to 500 C. All of the coatings reached steady state erosion rates after 50 to 150q of erodent particles had impacted their surfaces. DOE

N85-28101# Battelle Columbus Labs., Ohio. Physical Metallurgy Section.
HYDROGEN DEGRADATION OF PIPELINE STEELS Summary Report
J. H. Holbrook, H. J. Cialone, and P. M. Scott Jul. 1984 101 p refs Prepared for Brookhaven National Lab., Upton, N.Y.
(Contract DE-AC02-76CH-00016)
(DE85-008930; BNL-51855) Avail: NTIS HC A06/MF A01

The research has shown that Stage 2 fatigue-crack-growth acceleration indeed diminishes with increasing stress ratio to almost negligible levels at R = 0.8. However, an important new finding has been that hydrogen promotes premature transition to Stage 3 (rapid) fatigue-crack growth when the maximum stress intensity in hydrogen reaches a critical value. Pipe-section tests have shown that subcritical-crack growth in standard hardness pipeline steel base metal and typical weld heat-affected zones should not be a problem in practice. Rapid crack growth would occur by fatigue loading at considerably lower stress intensities than those that would cause subcritical-crack growth. Encouraging results were found with the studies on inhibitors. It was determined that oxygen, sulfur dioxide, and carbon monoxide provide strong inhibition of the worst effects of hydrogen, including fatigue-crack growth at low stress ratios, premature transition from Stage 2 to Stage 3 fatigue behavior, and subcritical-crack growth in simulated hard spots. DOE

N85-28102# Technische Hogeschool, Delft (Netherlands). Dept. of Aerospace Engineering.
ALUMINUM-LITHIUM ALLOYS: THE ANSWER OF THE ALUMINUM INDUSTRY TO THE THREAT OF ADVANCED FIBER-REINFORCED MATERIALS
H. F. deJong Jan. 1984 31 p refs
(VTH-LR-406) Avail: NTIS HC A03/MF A01

The development of aluminum-lithium alloys is discussed. The mechanical and physical properties are compared with those of conventional aluminum alloys and with advanced fiber reinforced composites. The economic aspects of the aluminum-lithium alloys are considered, and it is suggested that they can compete with advanced composites in many aerospace applications.
Author (ESA)

N85-28103# National Aerospace Lab., Amsterdam (Netherlands).
HYDROGEN EMBRITTLEMENT OF HIGH-STRENGTH STEEL
1983 16 p In DUTCH; ENGLISH summary Sponsored by Netherlands Agency for Aerospace Programs
(B8580075) Avail: NTIS HC A02/MF A01

A theory in which the planar pressure model and the lattice-decohesion model are combined was developed to describe the behavior of high strength steel for aeronautical purposes with respect to internal hydrogen embrittlement. This model (hydrogen pressure at an external crack as a function of the minimal tensile stress causing crack propagation) also gives an analytical basis to the lattice-decohesion model and it yields a quantitative description of both external and internal hydrogen embrittlement.
Author (ESA)

N85-27965*# Georgia Inst. of Tech., Atlanta.
CONSTITUTIVE CYCLIC DEFORMATION BEHAVIOR IN SINGLE-CRYSTAL AND DIRECTIONALLY SOLIDIFIED SSME HIGH-PRESSURE FUEL TURBOPUMP AIRFOIL MATERIALS Abstract Only
Walter W. Milligan, Eric S. Huron, and S. D. Antolovich *In* NASA. Lewis Research Center Struct. Integrity and Durability of Reusable Space Propulsion Systems May 1985 p 163-169 (For primary document see N85-27941 17-20)
Avail: NTIS HC A09/MF A01 CSCL 11F

N85-27966*# United Technologies of New Mexico, Inc., East Hartford, Conn.
HIGH-THERMAL-GRADIENT SUPERALLOY CRYSTAL GROWTH Abstract Only
David D. Pearson, Donald L. Anton, and Anthony F. Giamei *In* NASA. Lewis Research Center Struct. Integrity and Durability of Reusable Space Propulsion Systems May 1985 p 169 (For primary document see N85-27941 17-20)
Avail: NTIS HC A09/MF A01 CSCL 11F

N85-27967*# Carnegie-Mellon Univ., Pittsburgh, Pa.
ROLE OF HYDROGEN AND STRUCTURE ON CMSX-2 Abstract Only
C. L. Baker, J. Chene, W. Kromp, H. Pinczolitis, S. M. Bernstein, and J. C. Williams *In* NASA. Lewis Research Center Struct. Integrity and Durability of Reusable Space Propulsion Systems May 1985 p 171-180 (For primary document see N85-27941 17-20)
Avail: NTIS HC A09/MF A01 CSCL 11F

27 NONMETALLIC MATERIALS

Includes physical, chemical, and mechanical properties of plastics, elastomers, lubricants, polymers, textiles, adhesives, and ceramic materials.

N85-28104 Polish Academy of Sciences, Warsaw.
APPLICATION OF SCATTERING METHODS TO THE STUDIES OF THE STRUCTURE OF POLYMER BLENDS
Andrezej Wasiak 1984 62 p refs
(IFPR-13/1984; ISSN-0208-5658) Copyright. Avail: Issuing Activity

Blending of various problems appears to be an important and effective way of modification of properties of polymeric materials. It is worthwhile to note that not only chemical composition of constituents but also physical structure (morphology) of the blend determines its final properties. This situation produces need for appropriate methods for characterization of the morphology as well as need for studies of the effects of morphology on the physical properties of blends. Qualitative, and some quantitative informations can be obtained from direct observations by means of optical and electron microscopy, the other more sophisticated data are available from experiments involving scattering phenomena. Possible applications of scattering methods using different types of radiation towards the studies of the structure of polymer blends are reviewed.
B.W.

N85-28105 Department of the Air Force, Washington, D.C.
POLYAROMATIC ETHER-SULFONE-KEYTONES WITH FLUORO-SUBSTITUTED-p-CYCLOPHANE UNITS AS CROSS-LINKING SITES Patent
C. S. Marvel and S. Lin, inventors (to Air Force) Issued 19 Feb. 1985 5 p
(AD-D011649; US-Patent-4,499,258; US-Patent-Appl-SN-615507; US-Patent-Class-528-173) Avail: US Patent and Trademark Office CSCL 07/3

Polyaromatic ether-sulfone-ketones containing fluoro-substituted-p-cyclophane units were prepared from isophthaloyl chloride, terephthaloyl chloride, diphenyl ether, diphenoxydiphenyl sulfone and a small amount of ether 1,1,2,2,9,9,10,10-octafluoro(2,2)-p-cyclophane (type B) or pseudo-p-1,1,2,2,9,9,10,10-octofluoro (2,2)-p-cyclophane bis-acid chloride (type A) by a Friedal-Crafts type polymerization procedure. The p-cyclophane units were incorporated as cross-linking sites.
GRA

N85-28106*# Polytechnic Inst. of New York, Brooklyn. Polymer Research Inst.
NEW POLYMERS FOR COMPOSITES: A SUMMARY OF RESEARCH ON POLYSTYRYLPYRIDINES Final Report, 30 Apr. 1983
Eli M. Pearce 30 Apr. 1983 180 p refs
(Grant NAG2-225)
(NASA-CR-175886; NAS 1.26:175886) Avail: NTIS HC A09/MF A01 CSCL 11G

Styrylpyridine and its derivatives are studied. The synthesis, characterization, and thermal stability of styrylpyridine based polymers are discussed, as well as the preparation of a diglycidyl ester of styrylpridine. Also discussed are the preparation of polyarylates, and styrylpyridine based polytriazines and prepolymers.
R.J.F.

N85-28107*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
PREPARATION OF SILICON CARBIDE-SILICON NITRIDE FIBERS BY THE PYROLYSIS OF POLYCARBOSILAZANE PRECURSORS Final Report
B. G. Penn, J. G. Daniels, F. E. Ledbetter, III, and J. M. Clemons Mar. 1985 12 p refs
(NASA-TM-86505; NAS 1.15:86505) Avail: NTIS HC A02/MF A01 CSCL 11G

The development of silicon carbide-silicon nitride fibers (SiC-Si3N4) by the pyrolysis of polycarbosilazane precursors is reviewed. Precursor resin, which was prepared by heating tris(N-methylamino)methylsilane or tris(N-methylamino)phenylsilane to about 520 C, was drawn into fibers from the melt and then made unmeltable by humidity conditioning at 100 C and 95 percent relative humidity. The humidity treated precursor fibers were pyrolyzed to ceramic fibers with good mechanical properties and electrical resistivity. For example, SiC-Si3N4 fibers derived from tris(N-methylamino)methylsilane had a tensile rupture modulus of 29 million psi and electrical resistivity of 6.9 x ten to the 8th power omega-cm, which is ten to the twelfth power times greater than that obtained for graphite fibers.
R.J.F.

N85-28108*# Lehigh Univ., Bethlehem, Pa. Lab. No. 7.
PREPARATION OF POLYSTRYENE LATEX PARTICLES IN A ROTATING REACTOR Quarterly Progress Report, Mar. 1985
J. W. Vanderhoff, M. S. El-Aasser, F. J. Micale, E. D. Sudol, C. M. Tseng, and J. H. Kim Mar. 1985 16 p
(Contract NAS8-36286)
(NASA-CR-171475; NAS 1.26:171475; LU8-36186QR1) Avail:

NTIS HC A02/MF A01 CSCL 11J

The goal was to determine whether or not the rotating reactor can be used to grow monodisperse latex particles to sizes larger than are currently possible in ground-based processes. In order to accomplish this objective a two-fold experimental program was proposed: (1) the investigation of the operating characteristics of the reactor in terms of any temperature gradients which may exist while in operation, as well as, to what extent sedimentation and creaming are counteracted by the rotational motion of the cylinder; and (2) recipe development for producing large-particle-size monodisperse latexes in the reactor by the method of successive seeding. A description of the results obtained in temperature profile and particle concentration studies and in addition, several polymerizations of large-size latexes are presented. Author

N85-28109*# General Motors Corp., Indianapolis, Ind. Gas Turbine Div.

CERAMIC APPLICATIONS IN TURBINE ENGINES Final Report

Harold E. Helms, Peter W. Heitman, Leonard C. Lindgren, and Samuel R. Thrasher Oct. 1984 268 p refs

(Contracts DEN3-17; DE-AI01-77CS-51040)

(NASA-CR-174715; DOE/NASA/0017-6; NAS 1.26:174715; EDR-11442) Avail: NTIS HC A12/MF A01 CSCL 11B

The application of ceramic components to demonstrate improved cycle efficiency by raising the operating temperature of the existing Allison IGI 404 vehicular gas turbine engine is discussed. This effort was called the Ceramic Applications in Turbine Engines (CATE) program and has successfully demonstrated ceramic components. Among these components are two design configurations featuring stationary and rotating caramic components in the IGT 404 engine. A complete discussion of all phases of the program, design, materials development, fabrication of ceramic components, and testing-including rig, engine, and vehicle demonstation test are presented. During the CATE program, a ceramic technology base was established that is now being applied to automotive and other gas turbine engine programs. This technology base is outlined and also provides a description of the CATE program accomplishments. Author

N85-28110*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

A MICROGRAPHIC AND GRAVIMETRIC STUDY OF INTERCALATION AND DEINTERCALATION OF GRAPHITE FIBERS

Ching-cheh Hung 1985 13 p refs Presented at 17th Biennial Conf. on Carbon, Lexington, Ky., 16-21 Jun. 1985; sponsored by American Carbon Society

(NASA-TM-87026; E-2582; NAS 1.15:87026) Avail: NTIS HC A02/MF A01 CSCL 11D

Intercalation and deintercalation of Union Carbide P-100 graphite fibers with liquid and vaporous bromine was studied gravimetrically and microscopically. The mass of the bromine intercalated fibers was found to be 17 to 20 percent greater than their pristine counterpart. This variation decreased to 17 to 18 percent after heating in air for 3 days at 200 C and to 14.5 to 18 percent after 6 days of 260 C heating. The fiber length did not change throughout the experiment. The fiber diameter increased during intercalation and decreased slightly upon deintercalation but was not affected by heating to 260 C for 3 days in air. Comparing the mass and volume data to those with highly oriented pyrolitic graphite or natural single crystal graphite suggested the possibility that the intercalated P-100 fibers could be mostly stage 4. Author

N85-28111# Naval Weapons Center, China Lake, Calif.

THERMALLY STABLE ELASTOMERS: REVIEW OF SILARYLENE-SILOXANE POLYMERS AND POLYSILMETHYLENES

R. A. Rhein Oct. 1984 42 p

(AD-A152323; NWC-TP-6499) Avail: NTIS HC A03/MF A01 CSCL 07/3

This technical report is a review of the literature that pertains to two types of thermally stable elastomers: silarylene-siloxane polymers and polysilmethylenes. The silarylene-siloxane copolymers were generally prepared from the reaction of a bis (hydroxydialkylsilyl)arylene with a dialkylsilane containing two active groups, such as dichloro or bis(dimethylamino). These copolymers are thermally stable, decomposing at temperatures 50-100 C higher than that of the silicone polymers. The preparation and properties of the polydialkylsilmethylenes are discussed, with emphasis placed on polydimethylsilmethylene. These polymers are typically prepared from the ring-opening polymerization of 1,3-disilabutadienes; the preparation and physical properties of the polymers and the monomers are presented. GRA

N85-28112# Pennsylvania State Univ., University Park.

THE SYNTHESIS AND STRUCTURE OF POLYPHOSPHAZENES Final Report, 9 Dec. 1981 - 8 Dec. 1984

H. R. Allcock 29 Jan. 1985 5 p

(Contract DAAG29-82-K-0045)

(AD-A153134; ARO-18930.19-CH) Avail: NTIS HC A02/MF A01 CSCL 07/3

Film-forming polyphosphazenes have been delayed based in mixed substituent polymers, especially those with both hydrophilic and hydrophobic substituents. The surface hydrophobicity of such polymers has been studied as a function of the side group ratios. A variety of different synthetic methods have been devised and developed for the linkage of metal-containing groups to a phosphazene skeleton. These metallophosphazenes constitute a new class of compounds which, at the high polymeric level, should give rise to unusual electronic, catalytic, or thermal behavior. Major progress has been made in understanding the relationship between molecular structure and physical properties of polyphosphazenes by the synthesis and X-ray diffraction study of a series of linear short chain analogues of the high polymers to explore the reasons for unusual phenomena such as the low glass transition temperatures and the crystallization behavior. GRA

N85-28113# Oak Ridge National Lab., Tenn.

CHARACTERIZATION OF THE FATIGUE AND SLOW CRACK GROWTH BEHAVIOR OF PARTIALLY STABILIZED ZIRCONIA CERAMICS

V. J. Tennery, M. K. Ferber (Illinois Univ., Urbana), P. F. Becher, and S. B. Waters 1984 11 p refs Presented at the Automotive Technol. Develop. Contractors Coord. Meeting, Dearborn, Mich., 29 Oct. 1984

(Contract DE-AC05-84OR-21400)

(DE85-005240; CONF-8410103-8) Avail: NTIS HC A02/MF A01

The mechanical and physical behavior of two commercial MgO partially stabilized zirconia ceramics (Mg-PSZ) were studied as a function of temperature, time, stress, and environment. The characteristics of the precipitates within the cubic grains in these ceramics were studied via X-ray diffraction, (percent monoclinic) and dilatometry (transformation temperatures). Application of stress to these ceramics at temperatures in the range 800 to 7000(0)C results in an initial strength increase followed by a strength decrease. These changes do not occur when no applied stress (sigma sub a) is present. For TS-PSZ at 1000(0)C, when sigma sub a = 172 MPa = 0.6 sigma sub f (fast fracture strength), the strength increases to approx. = 120% of the initial strength at approx. = 200 h followed by a decrease to approx. = 85% of initial strength at 1000 h. The resistance to subcritical crack growth at 22(0)C in these ceramics increases with increase in toughness and is also sensitive to the local concentration of H2O. Higher H2O concentration results in accelerated crack growth. DOE

N85-28114# Brookhaven National Lab., Upton, N. Y.

DEVELOPMENT OF CONCRETE POLYMER MATERIALS

J. J. Fontana Oct. 1984 34 p refs Presented at the 4th Tech. Conf. on Reinforced Plastics in Corrosion and Construct. Appl., Las Vegas, Nev., 9 Apr. 1985

(Contract DE-AC02-76CH-00016)

(DE85-005957; BNL-35496; CONF-850497-1) Avail: NTIS HC A03/MF A01

The properties of PC make it suitable for the repair of concrete structures and for the placement of impermeable, skid-resistant

overlays. PC patching can be cast-in-place and will cure rapidly over a wide range of temperatures (20(0)F to 100(0)F), develop high strengths in a few hours, and bond well to portland cement concrete. Two methods of application and several monomer systems have been used with success for the installation of PC overlays. To date, the feasibility of using PC liners for steel pipe, vessels, or tanks to extend their service life in geothermal environments has been confirmed. Aggressive corrosive fluids do not cause deterioration in specially designed PC at temperatures close to 250(0)C. Commercial methods for the application of such liners have been developed and shown to be cost effective. The insulation of LNG impounding dike installations with IPC composites has been shown to be feasible. The safety benefits accrued from such installations will reduce the hazards of explosive mixtures in the event of an accidental LNG spill. The use of IPC as a dike insulation will be implemented as early as spring 1985. DOE

N85-28115# Sandia Labs., Albuquerque, N. Mex.
MODEL FOR THE GROWTH OF FRACTAL SILICA POLYMERS
K. D. Keefer 1985 17 p refs Presented at 2nd Intern. Conf. on Ultrastruct. Process. of Ceramics, Glasses and Composites, Daytona Beach, Fla., 25 Feb. 1985
(Contract DE-AC04-76DP-00789)
(DE85-007884; SAND-85-0401C; CONF-850267-2) Avail: NTIS HC A02/MF A01

A new model of random growth in solutions of partially hydrolyzed Si(OC2H5)4 gives rise to polymers with fractal structures, while an analogous model for growth from fully hydrolyzed orthosilicic acid results in dense particles. These models qualitatively account for differences in the small angle X-ray scattering curves obtained from alkaline solutions with different degrees of hydrolysis. Further development of random growth model may help to explain the great diversity of silicate polymers. DOE

N85-28116# Oak Ridge National Lab., Tenn.
INDIRECT BRAZING OF STRUCTURAL CERAMICS FOR UNCOOLED DIESELS
P. P. Hammond, S. A. David, and J. J. Woodhouse 1984 8 p refs Presented at the Automotive Technol. Develop. Contractors' Coord. Meeting, Dearborn, Mich., 29 Oct. 1984
(Contract DE-AC05-84CR-21400)
(DE85-005569; CONF-8410103-10) Avail: NTIS HC A02/MF A01

An important technological advance was made recently when processes were demonstrated for brazing partially stabilized zirconia (PSZ) to nodular cast iron (NCI) at a temperature sufficiently low (735(0)C) as not to degrade the properties of NCI. This advance was enabled by a new process, termed the active substrate process, rather than by the usual active filler metal approach. The brazing is performed in vacuum and utilizes treatment of the ceramic surface with an active agent to trigger wetting and strong bonding, in conjunction with a ductile, low-melting filler metal. The cast iron is specially treated to enable the filler metal to braze to it. Single-cycle (one-stage) processes are detailed for joining PSZ to NCI with a titanium transition piece to minimize strain on the ceramic and also without the TP. Preliminary data are presented on shear strength at the braze interfaces and on resistance to thermal shock and thermal cycling of 2.5-cm dia demonstration joints. DOE

N85-28117# Case Western Reserve Univ., Cleveland, Ohio. Dept. of Metallurgy.
MICROSTRUCTURE-MECHANICAL PROPERTY RELATIONSHIPS IN TRANSFORMATION-TOUGHENED CERAMICS Progress Report
A. H. Heuer 15 Jan. 1985 75 p refs
(Contract DE-AC02-83ER-45006)
(DE85-009722; DOE/ER-45006/T1) Avail: NTIS HC A04/MF A01

Transformation toughened ZrO2 containing ceramics is studied. The study concentrated on Ostwald ripening in ZrO2 toughened Al2O3 (ZTA), plastic deformation of stabilized ZrO2 single crystals, and the stress induced tetragonal(YIELDS) monoclinic martensitic transformation in Y2O3 containing tetragonal ZrO2 polycrystals. The experiment is applicable to the entire field of transformation toughened ceramics. DOE

N85-28118# Cornell Univ., Ithaca, N.Y. School of Mechanical and Aerospace Engineering.
EXPERIMENTS AND MICROMECHANICAL MODELS FOR CREEP-RUPTURE IN POLYMER MATRIX COMPOSITES Progress Report, 15 Jun. 1984 - 14 Jun. 1985
S. L. Phoenix Mar. 1985 28 p refs
(Contract DE-FG02-84ER-45112)
(DE85-009533; DOE/ER-45112/1) Avail: NTIS HC A03/MF A01

Time dependent failure in the long term (stress- or creep-rupture) results from thermally or environmentally activated growth of flaws in the fibers, or viscoelastic creep in the matrix, or a combination of both. This creep causes a widening pattern of stress redistribution on fibers near fiber breaks that is ultimately felt as increasing overload factors in time. As a result of these two mechanisms, sequences of adjacent fiber breaks grow in time, one of which eventually becomes unstable and fractures the composite. Statistical and micromechanical models of this failure process are developed which can be used to forecast the long-term reliability of large composite structures. Components of these models are constitutive laws for creep of the matrix in shear, statistical distributions for flaws in the fibers and their kinetics of breakdown, and a modified shear-lag analysis for determining the stress redistribution on fibers adjacent to breaks. The focus is on power law versions of the various models in both stress and time, since these yield the most tractable analysis and useful results. DOE

N85-28119# Sandia Labs., Albuquerque, N. Mex.
Ac FIELD-INDUCED ORDER IN DENSE COLLOIDAL SYSTEMS
Alan J. Hurd, Seth Fraden (Brandeis Univ.), and Robert B. Meyer (Brandeis Univ.) 1985 12 p refs Presented at the 2nd Intern. Conf. on Ultrastruct. Process. of Ceram., Glasses and Composites, Daytona Beach, Fla., 25 Feb. 1985
(Contracts DE-AC04-76DP-00789; DE-FG02-84ER-45084)
(DE85-009107; SAND-84-2564C; CONF-850267-3) Avail: NTIS HC A02/MF A01

The effects of electric fields on colloidal suspensions were studied and the various aspects and applications of electrophoresis in static fields were presented. It is demonstrated that dipole moments, induced by a strong, alternating external field, can create strong spatial correlations; ordering occurs first as chains of particles, then, at higher fields, as close packed structures. These correlations are important for understanding the electrical behavior of dense suspensions. The potential application of electric field effects in ceramics are pointed out. Since large voids in the particle packing are generally known to decrease the strength of the sintered ceramic, the ideal packing would be a close packed colloidal crystal. Pressure is commonly applied to densify green bodies, but it seldom produces maximal packing density. However, the difference in defect distribution may be critical. An alternating electric field seems to be a good candidate since it has the additional advantage of being adjustable in strength. DOE

N85-28120# Argonne National Lab., Ill. Fusion Power Program.
DESIGN OF THE WAVEGUIDE FOR MICROWAVE HEATING OF SOLID LITHIUM CERAMIC BLANKETS
R. L. Kustom, P. Fendley, and J. Tidona Jan. 1985 17 p refs
(Contract W-31-109-eng-38)
(DE85-009776; ANL/FPP/TM-198) Avail: NTIS HC A02/MF A01

A description is given of the design or a dielectric loaded waveguide for thermohydraulic testing of solid ceramic tritium breeder material in a nonnuclear environment. The dielectric loaded waveguide provides uniform heating over module surfaces that would face a fusion reactor plasma and simulates the exponential power decay characteristic of the neutron flux over the high power region of the blankets. A 200 MHz design suitable for modules with cross section of up to 20 x 40 cm is presented. DOE

N85-28121# Du Pont de Nemours (E. I.) and Co., Aiken, S.C.
PHYSICAL-CHEMICAL MODEL FOR THE MECHANISM OF GLASS CORROSION WITH PARTICULAR CONSIDERATION OF SIMULATED RADIOACTIVE WASTE GLASSES Ph.D. Thesis
Bernd Grambow [1985] 145 p refs Transl. into ENGLISH of Ph.D. Thesis from Freie Univ., Berlin, 1984
(DE85-007713; DP-tr-78) Avail: NTIS HC A07/MF A01

A physical-chemical model for the mechanism of glass corrosion is described. This model can be used for predicting, interpreting, and extrapolating experimental results. In static leaching tests the rate of corrosion generally decreases with time. Some authors assume that the surface layer, which grows during the course of the reaction, protects the underlying glass from further attack by the aqueous phase. Other authors assume that the saturation effects in solution are responsible for reducing the rate of the reaction. It is demonstrated within the scope of this work that examples can be found for both concepts; however, transport processes in the surface layer and/or in solution can be excluded as rate-determining processes within a majority of the examined cases. The location of the corrosion reaction is the boundary surface between the surface layer and the not yet attacked glass (transition zone). DOE

N85-28122# Clark Coll., Atlanta, Ga. Dept. of Physics.
INVESTIGATION OF CHARGE TRANSPORT IN THE THERMOELECTRET STATE OF SOME CERAMICS AND GLASSES Progress Report
O. P. Puri 8 Feb. 1985 4 p
(Contract DE-FG05-84ER-45128)
(DE85-009318; DOE/ER-45128/T1) Avail: NTIS HC A02/MF A01

The understanding of materials (solids) which normally exist as electronic insulators is reviewed. By studying the charge storage/transport processes occurring in a selected group of materials in which some unusual phenomena occur under suitable conditions, e.g., electric formation, ferromagnetism, ferroelectricity, and superionic conduction. The mechanisms associated with the formation and decay of electrics in Lead Titinate (PbTio3), which was obtained in powder form, is studied. Lead Titinate is a nonpolar inorganic polycrystalline amorphous dielectric. Empirical data on the formation of electrets in this material under different conditions of temperature, polarizing fields and cooling rates is collected. The decay of these electrets, in open and closed circuits, was obtained. E.R.

N85-28123# Sueddeutsches Kunststoff-Zentrum, Wuerzburg (West Germany).
NATURAL AND ACCELERATED AGING OF PLASTICS [NATUERLICHE UND BESCHLEUNIGTE ALTERUNG BEI KUNSTSTOFFEN]
G. Poschet [1984] 11 p refs In GERMAN
Avail: NTIS HC A02/MF A01

Environmental factors which influence the aging of plastics are treated. Concerning radiation, which is mainly solar, the UV-part is the most important for aging, its energy being able to split macromolecules and to build and chain radicals. Temperature increases substantially affect aging by enhancing chemical reaction rates. Humidity can facilitate the diffusion of gases. Mechanical stresses affect aging when they are above a certain threshold. The effects of all these factors are intensified by artificial weathering. Testing procedures to accelerate the aging effects of radiation, temperature, and humidity are described.
Author (ESA)

N85-28124# Bayer A.G., Krefeld (West Germany). Zentralbereich Zentrale Forschung und Entwicklung.
NEW AIR-CURING LACQUER SYSTEMS WITH HIGH SOLIDS CONTENT Final Report, Dec. 1983
Rolf Dhein, Erich Eimers, Knud Reuter, and Guenter Ruf Bonn Bundesministerium fuer Forschung und Technologie Jan. 1985 108 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-85-005; ISSN-0340-7608) Avail: NTIS HC A06/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 22.50

Reactive diluents to reduce the solvent content in air curing alkyd resins were developed. Reactive diluents with a solid content < or = 80% in white pigment lacquers are produced. Solvent reduction in long oil alkyd resins is achieved with Si-containing methacrylates but is too costly. The more economical methacrylates of saturated cyclic alcohols though showing embrittlement and drying retardation in industrial lacquers meet the technical demands, as do the methacrylic acid derivatives of dicyclopentadiene and norbornane (ene) with the exception of a small wrinkling tendency at elevated drying temperatures. Author (ESA)

N85-28125# Rosenthal-Stemag, Technische Keramik A.G., Selb (West Germany). Werksgruppe 4.
DEVELOPMENT OF HIGH TEMPERATURE RESISTANT, NON-CORROSIBLE, NON-METALLIC CERAMIC MATERIALS, ESPECIALLY SILICON NITRIDE IN GAS TURBINE APPLICATION Final Report, Feb. 1983
Michael Blecha and Hans-Juergen Pohlmann Bonn Bundesministerium fuer Forschung und Technologie Mar. 1985 93 p In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-85-015; ISSN-0340-7608) Avail: NTIS HC A05/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 19.50

Bending strength, thickness and oxidation resistance of silicon nitride were improved using silicon powder with fine or coarse grain structure. Optimized metal forming techniques such as isostatic pressing, injection molding, foil casting and bonding techniques are applied to produce components for an automobile gas turbine. Author (ESA)

N85-28126# Rosenthal-Stemag, Technische Keramik A.G., Selb (West Germany). Werksgruppe 4.
DEVELOPMENT OF HIGH TEMPERATURE RESISTANT NON-CORRODIBLE SILICON CARBIDE COMPONENTS FOR GAS TURBINE APPLICATIONS, FOLLOW-UP REPORT Final Report, Apr. 1983
Michael Blecha and Hans-Juergen Pohlmann Bonn Bundesministerium fuer Forschung und Technologie Mar. 1985 65 p In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-85-016; ISSN-0340-7608) Avail: NTIS HC A04/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 13.50

Silicon carbide production techniques such as isostatic pressing, injection molding and foil casting were improved to develop high temperature resistant noncorrodible components for gas turbines. Two variations of SiSiC with different grain distribution and size were standardized and tested as spray grain. The development is assessed by metallurgical structure analysis using ceramographic and fractographic methods. Combustion chambers produced by isostatic pressing and machining, and heat exchangers were tested. The bonding of single foils is improved. An optimized infiltration system allows accurate dosage of silicon and reduction of oxygen infiltration in the oven. Series production of silicon carbide components is recommended. Author (ESA)

28 PROPELLANTS AND FUELS

Includes rocket propellants, igniters, and oxidizers; storage and handling; and aircraft fuels.

For related information see also *07 Aircraft Propulsion and Power, 20 Spacecraft Propulsion and Power,* and *44 Energy Production and Conversion.*

N85-28127*# Colorado School of Mines, Golden. Dept. of Chemistry and Geochemistry.
JET FUEL INSTABILITY MECHANISMS Final Technical Report, 1 Aug. 1981 - 31 Mar. 1985

S. R. Daniel 31 Mar. 1985 104 p refs
(Grant NAG3-197)
(NASA-CR-175856; NAS 1.26:175856) Avail: NTIS HC A06/MF A01 CSCL 21D

The mechanisms of the formation of fuel-insoluble deposits were studied in several real fuels and in a model fuel consisting of tetralin in dodecane solution. The influence of addition to the fuels of small concentrations of various compounds on the quantities of deposits formed and on the formation and disappearance of oxygenated species in solution was assessed. The effect of temperature on deposit formation was also investigated over the range of 308-453 K. G.L.C.

N85-28128# Ogden Air Logistics Center, Hill AFB, Utah. Propellant Lab. Section.
MM2 LRSLA TESTING STAGE 3 PROPELLANT Semiannual Test Results
E. M. Dalaba Jan. 1985 146 p
(AD-A152540; MANPA-501(85)) Avail: NTIS HC A07/MF A01 CSCL 21/8

Data in this report is a continuation of LRSLA testing on Stage 3 Dissected Motors. Problems in testing C-7 bonds were not alleviated by changing specimen size as previously suggested. The data variation that has been observed has prompted a closer analysis of testing for variance. The plotted points used on the regression plots are a combined average of test results at a designated test period. The data variance within test periods is now demonstrated with the addition of separating the test results into individual plotted points on the regressions for each test period. Data variance between motors is demonstrated by the use of unique motor plot symbols in the multi-motor regressions. These unique symbols are data mean values and the number of samples per mean can be found with its minimum and maximum values in the sample size summary. Author (GRA)

N85-28129# Boeing Military Airplane Development, Seattle, Wash.
FUEL FREEZE POINT INVESTIGATIONS Final Report, Sep. 1982 - Mar. 1984
L. A. Desmarais and F. F. Tolle Wright-Patterson AFB, Ohio AFWAL Jul. 1984 286 p
(Contract F33615-82-C-2262)
(AD-A152801; D180-28285-1; AFWAL-TR-84-2049) Avail: NTIS HC A13/MF A01 CSCL 21/4

The objective of this program was to conduct a detailed assessment of the low temperature environment to which USAF aircraft are exposed for the purpose of defining a maximum acceptable fuel freeze point and also to define any operational changes required with the use of a high freeze point fuel. A previous study of B-52, C-141, and KC-135 operational missions indicated that the -58 C freeze point specification was too conservative. Based on recommendations resulting from the previous program, several improvements in the method of analysis were made, such as: expansion of the atmospheric temperature data base, the addition of ground temperature analysis, the addition of fuel freezing analysis to the one-dimensional fuel temperature computer program, and the examination of heat transfer in external fuel tanks, such as pylon or tip tanks. The B-52, C-141, and KC-135 mission were analyzed again, along with the operational missions of two tactical airplanes, the A-10 and F-15; -50C was determined to be the maximum allowable freeze point for a general purpose USAF aviation turbine fuel. Higher freeze points can be tolerated if the probability of operational interference is acceptably low or if operational changes can be made. Study of atmospheric temperatures encountered for the missions of the five study aircraft indicates that a maximum freeze point of -48 C would not likely create any operational difficulties in Northern Europe. GRA

N85-28130# Southwest Research Inst., San Antonio, Tex.
EVALUATION OF PYROTECHNIC FIRE SUPPRESSION SYSTEM FOR SIX PYROTECHNIC COMPOSITIONS Final Report
L. M. Vargas and J. Caltagirone Dover, N.J. Army Armament Research and Development Center Mar. 1985 68 p
(Contract DAAK10-83-C-0155)
(AD-A152995; AD-E401306; SWRI-06-7668; ARLCD-CR-85006)
Avail: NTIS HC A04/MF A01 CSCL 19/1

A test program was conducted to evaluate the effectiveness of water deluge systems in combating fires from various pyrotechnic materials and also to assess the detectability of pyrotechnic material fires including smoke mixes. Deluge tests were conducted on six pyrotechnic materials varying the quantity of pyrotechnic mix, the shape of the mix, the condition of the mix (wet or dry), the ignition point, the number of detectors, the height of the deluge system above the mixer, and the water application rate. Tests were conducted on the smoke mixes using standard UV detectors and a prototype dual mode smoke/UV detector. The conclusions and recommendations were formulated from analysis of the recorded test data. GRA

N85-28131# Ballistic Research Labs., Aberdeen Proving Ground, Md.
LIQUID PROPELLANTS FOR USE IN GUNS: A REVIEW Final Technical Report
N. Klein Feb. 1985 41 p
(AD-A153051; AD-F300602; BRL-TR-2641) Avail: NTIS HC A03/MF A01 CSCL 19/1

The use of liquid propellants in guns is reviewed both historically and in terms of the characteristics and properties required of such materials. The physical and chemical characteristics required of propellant formulations is strongly predicated on application in a particular weapons system and, based on such system requirements, the aqueous monopropellants consisting of the nitrate salts of hydroxylamine and an aliphatic, tertiary amine are shown to currently hold the greatest promise for use in a medium-to-large caliber artillery gun. Rationale for the selection of these compounds is described and the properties and reactions of these mixtures are discussed. The review does not discuss the gun systems considered but is limited to the propellants, their properties, and reactions. GRA

N85-28132# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
A CLOSED LOOP ANALYSIS OF POGO INSTABILITY M.S. Thesis
D. A. Rosenberg Dec. 1984 125 p
(AD-A153121; AFIT/GA/AA/84D-9) Avail: NTIS HC A06/MF A01 CSCL 21/9

In this thesis, a generalized computer code for the simulation of POGO instability in liquid rockets was generated and verified. The term POGO refers to the out of phase motion of the ends of a liquid rocket, which can build to a dangerous magnitude due to propulsion feedback. The elimination of any POGO instability will be of great importance in the development of future liquid rocket systems such as orbital transfer and orbital maneuvering vehicles. The model detailed in this investigation is based on a method of characteristics solution of the simplified Navier-Stokes equations. The resulting non-linear differential equations were solved using first order finite difference methods. This solution was applied to the fluid lines of several liquid rocket systems. Boundary conditions, based on component models used generally throughout the literature were developed to link these fluid lines. The computer routines were verified by comparison with published results from several sources. The results of numerous runs agreed quite well with the published data, even in very non-linear systems with large disturbance amplitudes. As an aid to future investigators the routines developed in this thesis were applied to a typical bipropellant liquid rocket system. GRA

N85-28133# Mobil Research and Development Corp., Paulsboro, N.J.
CONVERSION OF METHANOL TO GASOLINE: ENGINEERING AND CONSTRUCTION OF THE DEMONSTRATION PLANT
D. Flatow, N. Daviduk, and H. Heiart Mar. 1984 122 p Prepared in cooperation with Union Rheinische Braunkohlen Kraftstoff, A.G. and Uhde, G.m.b.H
(DE85-003237; DOE/NBM-5003237) Avail: NTIS HC A06/MF A01

The engineering and construction of the demonstration plant was initiated in July, 1979, and completed in December, 1982. The scheduled modification of the plant from external to internal reactor cooling took place from September through December, 1983. Both the engineering design and construction efforts were completed on schedule and within acceptable budget limitations. The process design basis package was prepared by Mobil Research and Development Corporation, USA (MRDC) and was updated as the result of MRDC's operating experience with a full-scale, non-reacting flow model built at their Paulsboro, N.J. Laboratory. The detail engineering, construction management, and most of the procurement were conducted by Uhde GmbH, Dortmund. The demonstration plant was erected in Wesseling, Germany, on URBK's plant site. This location provided all required support facilities, including feedstock, utilities, manpower, and analytical and data handling services. Performance of the demonstration plant since start-up in December, 1982 has shown that the versatility designed into the plant enabled all operating goals to be met or exceeded. DOE

N85-28134# Midwest Research Inst., Golden, Colo. Solar Energy Research Inst.
ALCOHOL FUELS PROGRAM TECHNICAL REVIEW, SPRING 1984
Oct. 1984 82 p
(Contract DE-AC02-83CH-10093)
(DE85-002919; SERI/SP-231-2405) Avail: NTIS HC A05/MF A01

The alcohol fuels program consists of in-house and subcontracted research for the conversion of lignocellulosic biomass into fuel alcohols via thermoconversion and bioconversion technologies. In the thermoconversion area, the SERI gasifier has been operated on a one-ton per day scale and produces a clean, medium-Btu gas that can be used to manufacture methanol with a relatively small gas-water shift reaction requirement. Recent research has produced catalysts that make methanol and a mixture of higher alcohols from the biomass-derived synthetic gas. Three hydrolysis processes have emerged as candidates for more focused research. They are: a high-temperature, dilute-acid, plug-flow approach based on the Dartmouth reactor; steam explosion pretreatment followed by hydrolysis using the RUT-C30 fungal organism; and direct microbial conversion of the cellulose to ethanol using bacteria in a single or mixed culture. Modeling studies, including parametric and sensitivity analyses, have recently been completed. DOE

N85-28135# Technische Univ., Hamburg (West Germany). Measurement Technology Group.
ASSESSMENT STUDY OF LIQUID CONTENT MEASUREMENT METHODS APPLICABLE TO SPACE MISSIONS Final Report
Hauke Trinks Paris ESA 30 Oct. 1984 67 p refs
(Contract ESTEC-5887/84/NL-PB(SC))
(TU-HH-TRI-ESA-84-2; ESA-CR(P)-1990) Avail: NTIS HC A04/MF A01

Liquid content measurement methods for liquid hydrogen and superfluid helium gaging under zero g conditions for the Infrared Space Observatory were assessed. For liquid hydrogen and liquid propellants, a rod-like capacitance sensor sytem is proposed. For superfluid helium a rod-like superconductive wire system or a dissipated power method is proposed. The uncertainty concerning the knowledge of the liquid motion and distribution under zero g conditions in the tank can be compensated by a statistical data evaluation method using a large number of single measurement results. Author (ESA)

31 ENGINEERING (GENERAL)

Includes vacuum technology; control engineering; display engineering; and cryogenics.

N85-28136 Metals Society, London (England).
REMOVAL OF LONGITUDINAL INTERNAL FLASH FROM ELECTRICALLY WELDED TUBES
B. S. Derganov, V. V. Eriklintsev, P. M. Gavrilin, E. M. Krichevskii, and V. I. Kononova 15 Mar. 1984 11 p refs Transl. into ENGLISH from Stal (USSR), no. 7, 1983 p 47-49
(BLL-BISI-Trans-22380-(9022.06)) Avail: British Library Lending Div., Boston Spa, Engl.

Difficulties associated with the removal of internal flash by cutters during continuous welding are outlined. The design of a flash remover with a rotary roller cutter, developed for a 20 to 102 mill converted to induction welding to increase the welding rate is examined. The relationship between the cutter life and the welding rate is discussed. The development of efficient designs of ferrite units for high speed welding of HF induction heated tubes is reported. E.A.K.

N85-28137 Metals Society, London (England).
INFLUENCE OF TEMPERATURE IN MELTING AND CASTING ON QUALITY OF MEDIUM-ALLOY STEEL
B. A. Greshishchev and S. A. Kozlov 15 Mar. 1984 10 p refs Transl. into ENGLISH from Stal (USSR), no. 6, 1983 p 15-17
(BLL-BISI-Trans-22310-(9902.06)) Avail: British Library Lending Div., Boston Spa, Engl.

The influence of temperature conditions in the melting and pouring of a chromium nickel molybdenum steel on quality was studied on the basis of data obtained on industrial heats made in 50 t open hearth furnaces and cast into ingots. The steel concerned is often susceptible to the formation of fish eyes and cracks, and recommendations are given on changes in practice to avoid these defects. R.J.F.

N85-28138# TRW Defense and Space Systems Group, Redondo Beach, Calif.
LABORATORY MODELING OF ASPECTS OF LARGE FIRES
G. F. Carrier, F. E. Fendell, R. D. Fleeter, N. Gat, and L. M. Cohen 30 Apr. 1984 56 p
(Contract DNA001-83-C-0228)
(AD-A153152; AD-E301615; TRW-42504-6001-UT-00; DNA-TR-84-18) Avail: NTIS HC A04/MF A01 CSCL 13/12

The design, construction, and use of a laboratory-scale combustion tunnel for simulating aspects of large-scale free-burning fires are described. The facility consists of an enclosed, rectangular-cross section (1.12 m wide x 1.27 m high) test section of about 5.6 m in length, fitted with large sidewall windows for viewing. A long upwind section permits smoothing (by screens and honeycombs) of a forced-convective flow, generated by a fan and adjustable in wind speed (up to a maximum speed of about 20 m/s prior to smoothing). Special provision is made for unconstrained ascent of a strongly buoyant plume, the duct over the test section being about 7 m in height. Also, a translatable test-section ceiling can be used to prevent jet-type spreading into the duct of the impressed flow; that is, the wind arriving at a site (say) half-way along the test section can be made (by ceiling movement) approximately the same as that at the leading edge of the test section with a fully open duct (fully retracted ceiling). Of particular interest here are the rate and structure of wind-aided flame spread streamwise along a uniform matrix of vertically oriented small fuel elements (such as toothpicks or coffee-strirrers), implanted in clay stratum on the test-section floor; this experiment is motivated by flame spread across strewn debris, such as may be anticipated in an urban environment after severe blast damage. GRA

N85-28139# Center for Mathematics and Computer Science, Amsterdam (Netherlands). Dept. of Computer Science.
ENGINEERING ROBOT ACTIONS IN A COMPUTER INTEGRATED MANUFACTURING ENVIRONMENT
W. E. vanWaning Oct. 1984 11 p refs Submitted for publication
(CWI-CS-R8415; B8478823) Avail: NTIS HC A02/MF A01

A model according to which robot actions and the activities in manufacturing cells can be designed is presented. In the model,

design activities have three major aspects: specification, analysis and synthesis. Principles for the construction of programming systems for designing operations of robots and manufacturing cells are derived. The specification describes an external environment (the device to make and the tools to make it with). Given the outer environment and the knowledge specific to the discipline, the engineer designs possible inner structures that serve as strategies specifying how to make that device. It is important that the engineer can express the designs symbolically. When synthesizing the process-structure the designed manufacturing process is matched against the external environment. The need for simulation environments so that it is possible to test the design thoroughly on the basis of actually observed sensor-data before the programs are taken into production is stressed. Author (ESA)

N85-28140# National Aerospace Lab., Amsterdam (Netherlands).
THE APPLICATION OF NUMERICAL CONTROL (NC) IN MANUFACTURING WIND TUNNEL MODELS
1983 14 p In DUTCH; ENGLISH summary Sponsored by Netherlands Agency for Aerospace Programs
(B8580078) Avail: NTIS HC A02/MF A01

A numerically controlled milling machine with an accuracy of 0.01 to 0.02 mm adapted to the manufacturing of wind tunnel models, and a three axis measuring machine with an accuracy of 0.01 mm and a resolution of 0.05 mm on which models can be measured quickly and accurately are described. A procedure in which a given plasticine model is measured by the measuring machine to obtain the coordinates for models without numerical data is outlined. Author (ESA)

N85-28141# Kernforschungsanlage, Juelich (West Germany). Inst. fuer Reaktorentwicklung.
HOT ISOSTATIC PRESSING (HIP): TECHNIQUES, APPLICATIONS AND ECONOMICAL USE
H. Bousack Jan. 1985 85 p refs In GERMAN; ENGLISH summary
(JUEL-SPEZ-288; ISSN-0343-7639) Avail: NTIS HC A05/MF A01

Hot isostatic pressing (HIP) is used to regenerate defect components exposed to dynamic and permanent static loads causing pore formation. It consists in compacting and bonding of powders and solids by encapsulation. The HIP-equipment consists of a high pressure vessel, an oven and a rare gas system for production of isostatic pressure. The compacting procedure using diffusion and deformation processes depends on the pressing temperature. It is used in the production of hard metals, superalloys, fiber composites and ceramic components. It saves energy material and costs. Author (ESA)

N85-28142# Joint Publications Research Service, Arlington, Va.
USSR REPORT: ENGINEERING AND EQUIPMENT
15 May 1985 114 p refs Transl. into ENGLISH from various Russian articles
(JPRS-UEQ-85-004) Avail: NTIS HC A06/MF A01

A comprehensive compilation of abstracts from papers in the following fields is presented: (1) marine and shipbuilding; (2) nuclear energy; (3) nonnuclear energy; (4) industrial technology; (5) turbine engine design; (6) high energy devices; (7) optics; (8) photography; (9) fluid dynamics; (10) mechanics of solids; and (11) testing and materials. For individual titles, see N85-28143 through N85-28176.

N85-28143# Joint Publications Research Service, Arlington, Va.
HIGH-ALTITUDE TESTING OF SELECTIVE OPTICAL COATINGS FOR SOLAR RADIATORS AND COLLECTORS Abstract Only **c44**
M. I. Umarova *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-85-004) 15 May 1985 p 6 Transl. into ENGLISH from Izv. Akad. Nauk Tadzhiksoy SSR Otd. Fiz.-Mat., Fiz. i Geol. Nauk (USSR), no. 1 (91), Jan. - Mar. 1984 p 77-80 (For primary document see N85-28142 17-31)
Avail: NTIS HC A06/MF A01

The field testing of various selective coatings for solar radiators and collectors performed at elevations of 2500 m above sea level for 150 days in the mountains of Tadzhikistan is described. It was found that the spectral and integral optical characteristics of the solar converters are degraded far more rapidly at high altitudes than at low. The use of high altitude exposure makes it possible to obtain more reliable data on the operating characteristics of various types of selective optical coatings. It was found that the optical properties of an absorbing coating consisting of two layers (copper oxide and tin dioxide) on an aluminum substrate remained unchanged after the testing; therefore, this coating is recommended for solar collectors for use under high altitude conditions. Author

N85-28144# Joint Publications Research Service, Arlington, Va.
SELECTIVE COATINGS FOR SOLAR HEAT CONVERTERS Abstract Only **c44**
M. I. Umarova *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-85-004) 15 May 1985 p 6-7 Transl. into ENGLISH from Izv. Akad. Nauk Tadzhiksoy SSR Otd. Fiz.-Mat., Fiz. i Geol. Nauk (USSR), no. 2 (92), Apr. - Jun. 1984 p 61-71 (For primary document see N85-28142 17-31)
Avail: NTIS HC A06/MF A01

The possibility of obtaining a two layer selective coating consisting of a ferrous oxide and a transparent conducting layer by pulverization on a foil substrate in a unified technological process was investigated. In the pulverization method, a solution containing the chemical elements needed to produce the required layer was sprayed onto a heated substrate. The characteristics of a CuO + SnO2 selective coating were investigated in field tests under high altitude conditions, and indicate that this coating is suitable for solar energy converters. The coating is easy to produce, low in cost and resistant to solar radiation. Author

N85-28145# Joint Publications Research Service, Arlington, Va.
FLAT MAGNETOHYDRODYNAMIC INDUCTION PUMP Abstract Only **c75**
Ya. Ya. Valdmanis, R. R. Krishberg, and A. Ya. Shishko *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-85-004) 15 May 1985 p 12-13 Transl. into ENGLISH from Magnitn. Girodinam. (USSR), no. 4, Oct. - Dec. 1984 p 101-104 (For primary document see N85-28142 17-31)
Avail: NTIS HC A06/MF A01

An experimental study of a flat MHD induction pump was made for the purpose of evaluating the performance characteristics of such liquid metal pumps operating at high power levels with high values of the magnetic Reynolds number and a nearly unstable average velocity profile of turbulent flow. A bilateral inductor with 20 slots and 18 turns/slot wound through the yoke, slot width 8 mm and tooth width 6 mm, was used with an 80 mm wide and 5 mm high channel for liquid sodium formed by 1.5 mm thick steel walls. The air gap was 13 mm wide. The inductor coils could be connected in three different ways to form 3, 1.5, or 1 pole pairs (pole pitch 4.2, 8.4, or 12.6 cm correspondingly). Extra coils were added at both ends of the inductor for compensation of the longitudinal end effect. Three baffle plates of stainless steel were inserted longitudinally into the channel for stabilization of the flow within the inductor zone. The tests were performed at 300 C so as to avoid impurity related changes in the hydraulic properties of sodium at lower temperatures. Author

N85-28146# Joint Publications Research Service, Arlington, Va.
DEPENDENCE OF CHARACTERISTICS OF CENTRIFUGAL MAGNETOHYDRODYNAMIC CONDUCTION PUMP ON ELECTRICAL CONDUCTANCE OF END WALLS. PART 1: EXPERIMENT Abstract Only **c75**
V. A. Gorbunov, A. A. Klyukin, Yu. B. Kolesnikov, and V. Ye. Kolokolov *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-85-004) 15 May 1985 p 13 Transl. into ENGLISH from Magnitn. Girodinam. (USSR), no. 4, Oct. - Dec. 1984 p 105-108 (For primary document see N85-28142 17-31)
Avail: NTIS HC A06/MF A01

A centrifugal MHD conduction pump was studied experimentally in a special test stand for determining the dependence of its

pressure flow characteristics on the electrical conductance of its end walls. The active space of such a pump is a horizontal cylindrical cavity filled with liquid metal, flow of the latter from the axis toward the side wall being produced by application of a radial electric field and rotational flow about the axis being produced by application of a constant axial magnetic field. The combined action of both fields drives liquid metal into a pipeline tapped from an orifice in the side wall. Tests were performed with mercury and measurements were made without axial flow, to determine the dependence of the developed radial pressure and the electric field distribution on the electric current and on the magnetic induction with three different pairs of end walls. Author

N85-28147# Joint Publications Research Service, Arlington, Va.
VIBRATIONS OF ROTORS CONNECTED THROUGH COUPLINGS WITH BACKLASH Abstract Only **c07**
E. L. Poznyak and G. P. Mayorov *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-85-004) 15 May 1985 p 19-20 Transl. into ENGLISH from Mashinostr. (Moscow), no. 5, Sep. - Oct. 1984 p 36-42 (For primary document see N85-28142 17-31)
Avail: NTIS HC A06/MF A01

Couplings with backlash for turbine sets, while suitable for compensation of manufacturing and assembly imprecision, cause vibration of the rotors they connect - especially when the shifts of those rotors are not perfectly aligned. Such couplings are either of the fixed type without friction or of the flexible type with very significant friction, flange couplings and end sleeves belonging in the first group while those in the second group have a sleeve and claw, a sleeve with slit, or a sleeve with teeth. A qualitative performance and vibration analysis for the various types of couplings is based on corresponding force and motion diagrams. A computer-aided quantitative analysis for coupled rotors in an SKV 150 MW - 3000 rpm turbine set (total length 12 m, total mass 30 tons, pitch circle of toothed sleeve coupling 14 cm in diameter) confirms the theoretical prediction that the force distribution becomes more uniform with a decreasing relative magnitude of unbalance force as the load is increased. Experimental data indicate, however, that the mechanism of vibration buildup is much more complex, being not only different for vertical and horizontal vibrations but also leading to instability. Author

N85-28148# Joint Publications Research Service, Arlington, Va.
PRECISION DIE FORGING OF BLADES OR GAS TURBINES Abstract Only **c07**
E. G. Shastin *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-85-004) 15 May 1985 p 27 Transl. into ENGLISH from Energomashinostr. (Moscow), no. 8, Aug. 1984 p 20-22 (For primary document see N85-28142 17-31)
Avail: NTIS HC A06/MF A01

Precision die forging of blades for supersonic gas turbines and compressors is continuously competing with precision die casting, such blades being made of either heat-resistant alloy steels or titanium alloys. One problem in die forging is preheating the blanks and heat treatment without building up a weak surface layer thicker than the allowance for subsequent machining, this layer being either depleted of carbon and alloying elements (steels) or saturated with oxygen and hydrogen (titanium alloys). This problem has been solved by forging in a protective atmosphere or under vacuum. Two other problems are ensuring the necessary deformation of materials with low plasticity within a narrow temperature range and ensuring adequate mechanical strength and stability of the dies. These two problems, solved earlier by sequential forging and by hardening the platen, are now solved by utilizing the superplasticity effect in alloys with certain structural characteristics during deformation along certain temperature - strain-rate rate curves. Author

N85-28149# Joint Publications Research Service, Arlington, Va.
STRESSED-STRAINED STATE OF TIGHTENING BUCKLES IN SECTIONAL RUNNERS OF GAS TURBINES Abstract Only **c07**
I. K. Bakumenko and N. A. Kulakovskaya *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-85-004) 15 May 1985 p 27-28 Transl. into ENGLISH from Energomashinostr. (Moscow), no. 9, Sep. 1984 p 7-10 (For primary document see N85-28142 17-31)
Avail: NTIS HC A06/MF A01

The mechanical state of the 10 tightening buckles in sectional runners of GTN-16 gas turbine-generator sets at high operating temperatures and speeds, after balancing, is analyzed on the basis of the total force and moment balance. The Poisson effect for rotating disks and a 2.5 to 4-times nominal safety margin under variable load are taken into account. Rotational and thermal stresses as well as contact strsses are included, in addition to plain flexural and torsional stresses. A safety factor for tightness is defined for the joints, which can be higher or lower depending on the balance of forces on a joint. The calculations have been programmed in FORTRAN-4 for an M-222 computer. Calculations have been checked by experiments, the object being to design tightening buckles with more stable joints so as to reduce vibrations. Author

N85-28150# Joint Publications Research Service, Arlington, Va.
CALCULATION OF FRICTION AT SPHERICAL BEARING JOURNALS IN TURBOMACHINES Abstract Only **c37**
G. A. Khanin and L. G. Khanin *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-85-004) 15 May 1985 p 31 Transl. into ENGLISH from Teplotekhn. (Moscow), no. 10, Oct. 1984 p 61-63 (For primary document see N85-28142 17-31)
Avail: NTIS HC A06/MF A01

Formulas are derived for calculating the friction at spherical thrust bearing journals in turbomachines, under wither axial or axial and radial load. They are based on the equation of force balance in a spherical system of coordinates, assuming a symmetric cosinusoidal pressure distribution over the contact surface. The friction force is expressed as a surface integral of the pressure, the friction torque is expressed as a surface integral of pressure times radius. Both expressions are then replaced with equivalent simple algebraic ones containing an appropriate conversion coefficient each. These coefficients are represented in the form of triple factorial-trigonometric sums not too unwieldy for computer-aided evaluation, with the angular coordinates replaced expediently by half their sum and half their difference. In design calculations it is necessary to observe the constraint that the force acting at the mean shoe radius must not exceed the maximum allowable load. Author

N85-28151# Joint Publications Research Service, Arlington, Va.
SELF-SCANNING MDS-INTEGRATED PHOTOSENSOR STRIP **c33**
Yu. Kh. Kagan, E. L. Kashcheyev, S. V. Kruglikov, M. A. Mayorchuk, Yu. A. Manukhin, and S. I. Naymark *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-85-004) 15 May 1985 p 37-47 refs Transl. into ENGLISH from Avtometriya (Novosibirsk), v. 3, May - Jun. 1984 p 50-56 (For primary document see N85-28142 17-31)
Avail: NTIS HC A06/MF A01

Multielement MDS (metal-dielectric-semiconductor)-integrated photo-sensor strips are one of the new advances of semiconductor MDS technology. The most widespread types of these devices are photosensors based on CCD (charge-coupled devices) MDS-photodiode sensors and also structures of the photodiode-CCD-register type. If charge-coupled devices and photodiode sensors are compared, the advantages of MDS-photodiode sensors should include higher sensitivity, especially in the blue region of the spectrum, and higher homogeneity of sensitivity; the more significant disadvantages should include the dependence of video output capacitance on the number of elements connected to the output bus and, as a result, a reduction of the output signal voltage and an increase of noise. The effect of output bus capacitance can be reduced by introducing a preamplifier based on an MDS transistor into each photocell, which is connected by a source repeater scheme. The presence of a preamplifier uncouples the low signal current of the photodiode and the high capacitance of the output bus. G.L.C.

N85-28152# Joint Publications Research Service, Arlington, Va.
HOLOGRAPHIC INTENSITY CORRELATOR WITH PRIS-TYPE

PHOTOELECTRO-OPTICAL CONTROLLED TRANSPARENCY **c35**

A. N. Oparin, O. I. Potaturkin, V. I. Feldbush, and P. M. Shipov *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-85-004) 15 May 1985 p 49-54 refs Transl. into ENGLISH from Avtometriya (Novosibirsk), v. 3, May-Jun. 1984 p 57-61 (For primary document see N85-28142 17-31)

Avail: NTIS HC A06/MF A01

An opto-electronic image recognition system (IRS), in which online entry and preliminary processing were carried out by using a Fototitus-type photoelectrooptical controlled transparency (CT), was considered. The process of processing contour identified images was realized successfully in this system. However, when processing silhouette and half-tone images that comprise most real identified images (industrial features, images of terrain and so on), the dynamic range of the values of the correlation functions decreased significantly due to the low contrast of the produced contours which, in turn, led to a decrease of the reliability of identifying these images. The problem of enhancing the contrast of identified image contours, was solved by using a controlled transparency on the transverse electro-optical effect. As is known, online input and preliminary processing of identified images are carried out in these controlled transparencies within one write-erase cycle of the modulator (instead of two), which provides an additional advantage. G.L.C.

N85-28153# Joint Publications Research Service, Arlington, Va.
HOLOGRAPHIC CORRECTOR IN OBJECTIVE WITH COMPOUND MAIN MIRROR Abstract Only **c35**

Yu. D. Pimenov, Yu. Ye. Kuzilin, V. N. Sintsov, and N. A. Sitnik *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-85-004) 15 May 1985 p 78 Transl. into ENGLISH from Optiko-Mekhan. Prom. (Leningrad), no. 7, Jul. 1984 p 23-26 (For primary document see N85-28142 17-31)

Avail: NTIS HC A06/MF A01

A holographic corrector is considered for eliminating surface aberrations of the main telescope mirror, specifically a compound mirror, on the basis of the existing relation between spectral range, wavefront distortion, and chromatic aberration. This relation is examined for typical holographic conversion of a plane wavefront into a spherical one. A hologram recorded with counter light beams yields a spectral band which widens with decreasing thickness of the light-sensitive film and makes it possible to eliminate any path-difference resulting from wavefront conversion. This requires making the curvature of the photographic plate equal to half the sum of the curvature of the original reference wavefronts. Such a correcting hologram must be placed in the plane of the exit pupil of the objective. Author

N85-28154# Joint Publications Research Service, Arlington, Va.
PERFORMANCE EVALUATION OF FIBER-OPTIC CONVERTERS Abstract Only **c74**

M. A. Farakhutdinova and N. T. Suleymanov *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-85-004) 15 May 1985 p 78-79 Transl. into ENGLISH from Optiko-Mekhan. Prom. (Leningrad), no. 7, Jul. 1984 p 14-16 (For primary document see N85-28142 17-31)

Avail: NTIS HC A06/MF A01

Optical fibers are paired with photoelectric cells in optical receivers of measuring and data gathering systems. The two components of each pair must be matched with respect to reliability of information about the entire field of vision, matched on an interference-free basis. For this purpose, the performance of such an optoelectric converter can be evaluated in terms of reliability, defined as the probability of error-free signal conversion - such a conversion being possible only by failure-free operation of each photoreceiver component. General relations for the reliability as function of time are derived here, considering that the reliability is a product of two associated factors, parametric and catastrophic failures. Since the four governing fiber parameters (diameter, length, internal reflection coefficient, attenuation coefficient) are subject to random variance caused by manufacturing imprecision and the dependence of the luminous flux on these parameters is intricate, an analytical performance evaluation will not be feasible. Statistical simulation is done instead, assuming a normal distribution of random quantities in accordance with the central-limit theorem. Author

N85-28155# Joint Publications Research Service, Arlington, Va.
CHARACTERISTICS OF STEADY-STATE HYPERSONIC FLOW ABOUT BLUNTED BODIES WITH DISCONTINUITIES IN GENERATORS Abstract Only **c02**

V. D. Serova *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-85-004) 15 May 1985 p 80-81 Transl. into ENGLISH from Vestn. Leningr. Univ.: Mat. Mekhan. Astron. (Leningrad), v. 13, no. 3, Jun. 1984 p 80-85 (For primary document see N85-28142 17-31)

Avail: NTIS HC A06/MF A01

The BVLR method is employed to calculate the multi-shock axisymmetrical problem of hypersonic flow. The processes occurring during axisymmetrical shock wave interactions are assessed qualitatively. Comparison of the pressure behavior as a function of the longitudinal coordinate at points on the surface of smooth and discontinuous cones indicate that even a small discontinuity results in a major qualitative and quantitative difference in the threshold distribution curves. Author

N85-28156# Joint Publications Research Service, Arlington, Va.
IMPACT STARTING OF PLANE NOZZLES WITH WIDE DIVERGENCE ANGLE Abstract Only **c34**

A. B. Britan and Ye. I. Vasilyev *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-85-004) 15 May 1985 p 81 Transl. into ENGLISH from Izv. Akad. Nauk SSSR: Mekhan. Zhidkosti i Gaza (Moscow), no. 4, Jul. - Aug. 1984 p 100-106 (For primary document see N85-28142 17-31)

Avail: NTIS HC A06/MF A01

The starting characteristics of plane or axisymmetric reflecting shock-tube nozzles are analyzed, taking into account effects of a wide divergence angle and dependence of the form of shock waves on the geometry of the transonic nozzle segment. A nozzle mounted at one end of the tube is started by a shock wave coming from the other end and passing through the supersonic nozzle segment with initially quiescent homogeneous gas, a diaphragm in the throat section producing the necessary initial pressure drop at the nozzle entrance. The corresponding integral equations of nonsteady-state gas dynamics are formulated and solved for a nonviscous nonconducting perfect gas. Numerical solution by the McCormack method on a BESM-6 high-speed computer has yielded results in satisfactory agreement with a known theoretical solution for tapered nozzles. They deviate from experimental data, however, particularly on the upstream side of the secondary shock wave. This discrepancy is attributable to the design characteristics of experimental shock tubes. Correct simulation of the starting process must include flow through the subsonic segment of a reflecting nozzle. Author

N85-28157# Joint Publications Research Service, Arlington, Va.
BUILDUP OF OSCILLATION OF BODIES IN STRATIFIED FLUID Abstract Only **c34**

I. S. Dolina *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-85-0004) 15 May 1985 p 81 Transl. into ENGLISH from Izv. Akad. Nauk SSSR: Mekhan. Zhidkosti i Gaza (Moscow), no. 4, Sep. - Oct. 1984 p 87-93 (For primary document see N85-28142 17-31)

Avail: NTIS HC A06/MF A01

Forward motion of a circular cylinder driven by an elastic spring in the lower layer of a fluid medium, perpendicularly to its generatrix and parallel to the upper boundary of the layer, is analyzed for oscillations and instability. Calculations are based on a two-dimensional model, with an equation for the scalar potential in the lower layer and an equation for the vector potential in the upper layer of fluid. An expansion into Fourier series, with viscosity of the fluid explicitly taken into account, yields a dispersion equation whose zeros represent singularities of the Fourier integrals. It is first solved for low velocities and small oscillation amplitudes, assuming a strong damping or, for comparison, a weak

damping. Next is considered buildup of the oscillation amplitude into the range of nonlinearity and up to the stability limit. The results are extended to elliptical cylinders. Author

N85-28158# Joint Publications Research Service, Arlington, Va.
SUPERSONIC FLOW AROUND BLUNT WEDGE Abstract Only c02
S. V. Manuylovich *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-85-004) 15 May 1985 p 82 Transl. into ENGLISH from Izv. Akad. Nauk SSSR: Mekhan. Zhidkosti i Gaza (Moscow), no. 4, Jul. - Aug. 1984 p 137-140 (For primary document see N85-28142 17-31)
Avail: NTIS HC A06/MF A01

Supersonic flow of a perfect gas around a semi-infinite body in the form of a plane wedge with blunt leading edge is analyzed. The problem is assumed to be asymptotic with respect tot he longitudinal coordinate and is solved by the method of asymptotic expansion. The gas is assumed to have a C sup p/ ratio independent of the temperature and its uniform unperturbed motion is assumed to satisfy the Euler equations. The oncoming stream is assumed to flow in the direction parallel to the plane of symmetry of the wedge and to split symmetrically along the faces of the latter. Author

N85-28159# Joint Publications Research Service, Arlington, Va.
PROPULSION EFFICIENCY OF VIBRATING BODIES IN SUBSONIC GAS STREAM Abstract Only c34
M. N. Kogan and M. V. Ustinov *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-85-004) 15 May 1985 p 83 Transl. into ENGLISH from Izv. Akad. Nauk SSSR: Mekhan. Zhidkosti i Gaza (Moscow), no. 4, Jul. - Aug. 1984 p 128-132 Original language document was announced in IAA as A85-10111 (For primary document see N85-28142 17-31)
Avail: NTIS HC A06/MF A01

An axisymmetric body in a subsonic gas stream, namely an airfoil periodically deforming without loss of symmetry and change of length, is examined from the standpoint of thrust-power relation. The corresponding surface-time integrals for the drag force and the propulsion power are formulated in a cylindrical system of coordinates and evaluated, assuming a potential flow of the gas with small perturbations by the body. A time-independent source distribution density term is added to this time-dependent solution to insure a positive airfoil cross-sectional area. The maximum theoretical efficiency, or minimum power for given thrust, is calculated on this basis and the shape of the body is sought for which the real efficiency will approach the maximum theoretical one as closely as possible. Making the length of the body invariable in time leads to a discretely varying drag coefficient. Author

N85-28160# Joint Publications Research Service, Arlington, Va.
STEFAN-MAXWELL RELATIONS FOR PLASMA DIFFUSION CURRENTS IN MAGNETIC FIELD Abstract Only c75
A. F. Kolesnikov and G. A. Tirskiy *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-85-004) 15 May 1985 p 83-84 Transl. into ENGLISH from Izv. Akad. Nauk SSSR: Mekhan. Zhidkosti i Gaza (Moscow), no. 4, Jul. - Aug. 1984 p 148-154 (For primary document see N85-28142 17-31)
Avail: NTIS HC A06/MF A01

Equations of heat and mass transfer for plasma diffusion currents in a magnetic field are derived in the approximation of elastic pairwise collisions of particles unaffected by the external electromagnetic field, assuming that the transfer coefficients do not depend on the interaction of electrons with plasma oscillations. These equations are derived from the fundamental system of equations of diffusion currents and partial thermal currents in an isothermal N-component plasma in a magnetic field, those latter equations having been obtained earlier through solution of the corresponding Boltzmann equations by the Chapman-Enskog method. Exact Stefan-Maxwell relations for diffusion currents in a magntic field and exact relations for the transfer coefficients, including one for the thermal conductivity which extends the Muckenfuss-Curtiss relation, are obtained directly from the rations of complex determinants of successive orders N(zeta-1) and N(zeta-1)+1 respectively. Author

N85-28161# Joint Publications Research Service, Arlington, Va.
METHOD OF CALCULATING SEPARATION FLOW OF SUBSONIC GAS STREAM AROUND WINGS Abstract Only c02
S. M. Belotserkovskiy, V. N. Korzhnev, and S. D. Shipilov *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-85-004) 15 May 1985 p 84 Transl. into ENGLISH from Izv. Akad. Nauk SSSR: Mekhan. Zhidkosti i Gaza (Moscow), no. 4, Jul. - Aug. 1984 p 141-147 (For primary document see N85-28142 17-31)
Avail: NTIS HC A06/MF A01

The nonlinear problem of steady subsonic flow of a gas around a wind was solved by discrete vortices for compressible fluids. The corresponding differential equation for the potential of perturbed velocities, with the boundary condition of an impermeable wing surface, is solved separately and differently for two regions. The velocity integrals for the semifinite corridor around the wing and containing the vortex trail are evaluated by a numerical iteration process, after the two subregions are subdivided into respectively finite and semi-infinitely long rectangular parallelepipeds. In the remaining space outside this region the potential of perturbed velocities is linearizable and, with the aid of a Prandlt-Glauert transformation, its differential equation is reduced to the Laplace equation in appropriate coordinates. The analytical solution for this region depends on the solution for the corridor. The method was validated on two test problems. A range of angles of attack which corresponds to stabilization of nosing vortex filaments are revealed. Two estimates are given for the critical angle of attack, namely a lower bound at which the iteration process ceases to converge relative to the aerodynamic load and an upper bound where the shape of the vortex sheet and the lift coefficient and the pitching moment coefficient begin to change from one iteration to the next. E.A.K.

N85-28162# Joint Publications Research Service, Arlington, Va.
SUPERSONIC FLOW AROUND WEAK RADIATION SOURCES Abstract Only c02
K. V. Krasnobayev *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-85-004) 15 May 1985 p 85 Transl. into ENGLISH from Izv. Akad. Nauk SSSR: Mekhan. Zhidkosti i Gaza (Moscow), no. 4, Jul. - Aug. 1984 p 133-136 (For primary document see N85-28142 17-31)
Avail: NTIS HC A06/MF A01

The flow of interstellar wind around an X-ray source was simulated as the steady two-dimensional supersonic flow of an ideal perfect gas around a weak radiation source. Pressure and velocity, the equations of hydrodynamic are linearized. Solving the hyperbolic equation for the boundary condition of zero velocity perturbation at infinity by the linearization method is sufficiently accurate for supersonic flow only. This method is not applicable to transonic flow, or to hypersonic flow. In the latter case a self-adjoint solution for steady flow far past any radiation source is most expedient and easily obtained from the theory of strong detonation for thin bodies. E.A.K.

N85-28163# Joint Publications Research Service, Arlington, Va.
ELASTIC EQUILIBRIUM OF COMPOSITE SHELLS WITH FINITE SHEAR RIGIDITY Abstract Only c39
Ya. M. Grigorenko, I. S. Mukha, Ya. G. Savula, and N. P. Fleyshman *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-85-004) 15 May 1985 p 86 Transl. into ENGLISH from Dokl. Akad. Nauk Ukr. SSR: Ser. a Fiz.-Mat. i Tekhn. Nauki (Kiev), no. 7, Jul. 1984 p 33-36 Original language document was announced in IAA as A84-48022 (For primary document see N85-28142 17-31)
Avail: NTIS HC A06/MF A01

The boundary conditions of the junction of two intersecting shells of arbitrary shape are determined with allowance for transverse shear deformation. A method for determining the intersecting lines of the middle surfaces is proposed, and the finite element method is used to analyze the elastic equilibrium of the junction of a cylindrical shell with a plate. Results ae compared with those based on the theory of elasticity. B.J. (IAA)

N85-28164# Joint Publications Research Service, Arlington, Va.
STABILITY OF CYLINDRICAL SHELLS WITH VARIABLE THICKNESS UNDER EXTERNAL PRESSURE Abstract Only **c39**
V. V. Kabanov and L. P. Zheleznov *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-85-004) 15 May 1985 p 86-87 Transl. into ENGLISH from Prikl. Mekhan. (Kiev), v. 20, no. 7, Jul. 1984 p 53-59 Original language document was announced in IAA as A84-45794 (For primary document see N85-28142 17-31)
Avail: NTIS HC A06/MF A01

The problem of the stability of circular cylindrical shells of stepwise varying thickness loaded by external pressure is analyzed with allowance for the moment nature of the initial stress-strain state. The problem is solved using the finite element method in displacements. The method of successive approximation combined with the load stepping method is used to solve a system of nonlinear algebraic equations of equilibrium. The critical load is determined as the least root of an equation obtained by equaling to zero the stability determinant. The effects of the variability of the shell thickness and of the moment nature of the stress-strain state are examined. V.L. (IAA)

N85-28165# Joint Publications Research Service, Arlington, Va.
NATURAL VIBRATIONS OF REINFORCED SPHERICAL SHELLS Abstract Only **c39**
V. N. Revutskiy *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-85-004) 15 May 1985 p 87 Transl. into ENGLISH from Prikl. Mekhan. (Kiev), v. 20, no. 7, Jul. 1984 p 87 (For primary document see N85-28142 17-31)
Avail: NTIS HC A06/MF A01

A method is proposed to analyze the natural vibrations of a deep spherical shell clamped around its base parallel and reinforced with an array of hoops and meridional stringers. Such a shell is regarded as a compound body, a spherical segment representing the sheath and all hoops and stringers behaving like one dimensional thin curvilinear elastic elements. All materials of the shell are assumed to be isotropic and to obey Hooke's law. During small vibrations all reinforcing members undergo tension compression and flexure, the stringers flexing normal to the median surface of the sheath and the hoops flexing in their own planes. The corresponding equations for the shell are based on the Hamilton-Ostrogradskiy principle of stationary action and on two theories, Kirchhoff-Love theory for the sheath and Kirchhoff-Klebsch theory for the reinforcing members. The strain field of the shell is defined through the three orthogonal displacement components on the median surface and the resulting system of partial differential equations, in operator form, is solved by the Bubnov-Galerkin method. With the constraint coefficients stipulated in terms of Legendre functions of the first kind, this method reduces the problem to two infinite systems of homogeneous algebraic equations in associated Legendre polynomials. E.A.K.

N85-28166# Joint Publications Research Service, Arlington, Va.
NUMERICAL SOLUTION OF ONE-DIMENSIONAL NONLINEAR PROBLEMS OF STATICS FOR ELASTIC BEAMS AND SHELLS UNDER RIGID CONSTRAINTS Abstract Only **c39**
S. A. Kabrits and V. P. Terentyev *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-85-004) 15 May 1985 p 88 Transl. into ENGLISH from Prikl. Mekhan. (Kiev), v. 20, no. 7, Jul. 1984 p 96-100 (For primary document see N85-28142 17-31)
Avail: NTIS HC A06/MF A01

The problem of quasistatic geometrically and physically nonlinear deformation of a one dimensional elastic body reduces mathematically to a nonlinear two point boundary value problem with an adjustable parameter when the characteristics of the body are smooth and its deformation is unconstrained. The problem requires a variational formulation in the case of distributed constraints on displacements. The penalty method is proposed for solution of the problem in the latter case, with the interaction of the body and rigid perfectly smooth barriers simulated mechanically by unilateral contact with nonlinear elastic Winkler bases which follow the surface contour of those barriers in the initial state and develop a distributed normal reaction to normal penetration. The procedure combines the Newton-Kantorovich method of quasilinearization and the method of iterative continuation with respect to the numerical parameter. All linear boundary value problems arising in this procedure are solved by the S.K. Godunov method of orthogonal elimination. Most critical in the solution process is selection of the initial approximation or point on the load deflection curve. This is achieved by introducing a second numerical parameter which will result in a trivial solution to the thus modified equations for a zero pressure load. E.A.K.

N85-28167# Joint Publications Research Service, Arlington, Va.
METHOD OF SOLVING PROBLEMS OF STATICS FOR MULTILAYER SHELLS OF REVOLUTION Abstract Only **c39**
B. G. Popov and E. V. Raman *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-85-004) 15 May 1985 p 89 Transl. into ENGLISH from Prikl. Mekhan. (Kiev), v. 20, no. 7, Jul. 1984 p 59-65 Original language document was announced in IAA as A84-45795 (For primary document see N85-28142 17-31)
Avail: NTIS HC A06/MF A01

A variational matrix method is proposed for obtaining resolvent systems of first order differential equations for problems in the statics of multilayer shells of revolution. The number of layers and the structure of the multilayer stack in the shell are arbitrary; individual layers are assumed to have different deformation kinematics. The approach proposed here makes it possible to use a computer to obtain resolvent equations, in a form convenient for numerical solution, for shells with complex deformation models. V.L. (IAA)

N85-28168# Joint Publications Research Service, Arlington, Va.
SCATTERING OF SOUNDS BY PIEZOCERAMIC CYLINDRICAL SHELL NEAR RIGID SURFACE Abstract Only **c71**
I. V. Senchenko *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-85-004) 15 May 1985 p 90 Transl. into ENGLISH from Prikl. Mekhan. (Kiev), v. 20, no. 7, Jul. 1984 p 111-115 (For primary document see N85-28142 17-31)
Avail: NTIS HC A06/MF A01

Scattering of sound by an elastic cylindrical shell parallel to a perfectly stiff wall is analyzed, with emphasis on the effect of a reflecting surface behind the shell and of mode coupling on the diffraction field. The shell is assumed to be made of PZT-4 piezoceramic material with polarization across its thickness with open electrodes covering it. An ideal compressible fluid medium is assumed to fill the half space on the shell side of the wall. The problem reduces to a boundary value problem for a system of equations which includes the Helmholtz equation and equations of motion for a thin shell. This system of equations was solved by the method of reduction, with equality of the vibration velocities in the fluid and at the shell surface as criterion of accuracy. It is shown that dynamic excitation of modes other than the fundamental pulsating mode produces a nonuniform distribution of shell vibration velocity. The scattering pattern of the given elastic shell are compared with a perfectly soft one. Excitation of higher order harmonics has no appreciable effect on the far field as long as the shell remains near the wall, but the two patterns begin to differ as its distance from the wall measured in wavelengths increases. E.A.K.

N85-28169# Joint Publications Research Service, Arlington, Va.
PROPAGATION OF NON-AXISYMMETRIC ELASTIC WAVES THROUGH SHELL WITH FILLER UNDER RADIAL LOAD AT ONE END Abstract Only **c39**
Yu. V. Mastinovskiy and Yu. I. Nagornyy *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-85-004) 15 May 1985 p 90-91 Transl. into ENGLISH from Prikl. Mekhan. (Kiev), v. 20, no. 7, Jul. 1984 p 104-107 (For primary document see N85-28142 17-31)
Avail: NTIS HC A06/MF A01

A semiinfinite shell with a filler under a nonaxisymmetric radial load at the end was considered. The propagation of elastic waves along this shell is analyzed on the basis of the linear Timosnenko theory with the filler moving only radially. The corresponding system of second order differential equations of motion for the shell is, after introduction of dimensionless parameters and variables, reduced to matrix from representing 15 partial differential equations

for unknown displacements f, f'x, f't with three linear and two angular components each. It is solved by the method of characteristics for given initial and boundary conditions, the latter including conditions of contact between shell and filler. The dependence of wave propagation parameters on filler parameters is evaluated, assuming that the filler is a stack of frictionless disks of low density or high stiffness and thus effectively weightless material. The problem reduces to the Euler equation in radial displacements, solvable by the numerical method of grids. E.A.K.

N85-28170# Joint Publications Research Service, Arlington, Va.
ACOUSTIC OSCILLATIONS OF RODS AND PLATES Abstract Only **c71**
A. V. Zakharov, A. R. Fazylov, and R. Kh. Pirmatov *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-85-004) 15 May 1985 p 92 Transl. into ENGLISH from Izv. Akad. Nauk Tadzhiksoy SSR Otd. Fiz.-Mat., Fiz. i Geol. Nauk (USSR), no. 2 (92), Apr. - Jun. 1984 p 28-33 (For primary document see N85-28142 17-31)
Avail: NTIS HC A06/MF A01

An interference model of resonant and antiresonant acoustic oscillations of rods and plates is proposed that makes allowance for energy losses to internal friction and to adjacent members. Two simple models are examined: one of a rod with free edges, in which the oscillations were determined by energy losses to internal friction, and the other of a rod with partially reflecting ends, in which oscillations were determined by the escape of energy through the ends, and to some extent by losses to internal friction. Relationships make it possible to determine the oscillations of the element for both kinds of energy loss, and that are valid for resonant and antiresonant oscillations. The data can be used to analyze the transmission of acoustic oscillations through vibration insulating components and building members. E.A.K.

N85-28171# Joint Publications Research Service, Arlington, Va.
NMR MANOMETER FOR MEASURING HIGH PRESSURES AT LIQUID-HELIUM TEMPERATURES Abstract Only **c35**
V. D. Doroshev, N. M. Kovtun, A. N. Molchanov, P. I. Polyakov, and V. G. Synkov *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-85-004) 15 May 1985 p 94 Transl. into ENGLISH from Pribory i Tekhn. Eksperim. (Moscow), no. 4, Jul. - Aug. 1984 p 195-199 (For primary document see N85-28142 17-31)
Avail: NTIS HC A06/MF A01

A resonance manometer is described for measuring pressures of 1 to 20 kbar at 1.5 to 4.2 K. The device operates on the basis of the pressure dependence of the Nuclear magnetic resonance (NMR) frequency of 57 Fe in a weak ferromagnet-ferric borate FeBO3. Inasmuch as the nuclear magnetic resonance in FeBO3 is observed in superthin magnetic fields on nuclei without imposing an external magnetic field, it is possible to use any type of electric input, and the chamber can be made of magnetic materials. The NMR frequency varies linearly with pressure with a baric coefficient of 2.402 Hz/bar. The schematic diagram of the NMR spectrometer, which incorporates seven microcircuits, is presented. E.A.K.

N85-28172# Joint Publications Research Service, Arlington, Va.
PRINCIPLES OF DESIGNING DIGITAL COMPENSATING ACCELEROMETERS Abstract Only **c35**
A. I. Skalon *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-85-004) 15 May 1985 p 95-96 Transl. into ENGLISH from Izmereniya, Kontrol, Avtomatia. (Moscow), no. 1(49), 1984 p 43-50 (For primary document see N85-28142 17-31)
Avail: NTIS HC A06/MF A01

Digital compensating accelerometers use three types of feedback: (1) analog feedback with voltage-to-code or current-to-code conversion; (2) pulse-current conversion; pulse-current feedback; or (3) mechanical feedback through mass and strings. An accelerometer with voltage-to-code conversion, consists of a sensor, a position transducer, and amplifier which also converts the amplified signal to feedback current, an analog-to-digital converter shunted by a precision resistor, and a compensating current-to-force or current-to-torque converter. An accelerometer with current-to-code conversion includes, a reversible counter, a pulse generator, a current stabilizer, and a threshold device, all in parallel between two switches feeding into the feedback loop with an integrating capacitor across. In an accelerometer with a mass suspended betwen two orthogonal pairs of strings, the mass is the sensing element and the vibration frequency differences of the strings are the basis for compensation. Accelerometers with pulse-current feedback have a modulator behind a plain signal amplifier and a low-leakage transistor switch between the modulator and the compensating converter, this switch is also connected to a current stabilizer. The accuracy of the accelerometers is determined only by the error of the compensating converter, the instability and the nonlinearity of the current stabilizer, and the quality of the transistor switch. Author

N85-28173# Joint Publications Research Service, Arlington, Va.
UNIAXIAL ANGULAR ACCELEROMETERS Abstract Only **c35**
A. V. Seleznev and I. A. Shvab *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-85-004) 15 May 1985 p 96 Transl. into ENGLISH from Izmereniya, Kontrol, Avtomatiz. (Moscow), no. 1(49), 1984 p 32-42 (For primary document see N85-28142 17-31)
Avail: NTIS HC A06/MF A01

The basic mechanical components of an angular accelerometer are the sensor, the damper, and the transducer. Penumatic dampers are simplest in construction, but the viscosity of air is very low and, therefore, dampers with special purpose oils having a high temperature stability (synthetic silicon or organosilicon oils) are most widely used. The most common types of viscous dampers are lamellar with meshed opposed arrays of fixed and movable vanes in the dashpot, piston dampers regulated by an adjustable-length capillary tube, and dampers with paddle wheel in closed tank. Another type of damper is an impact-inertial one with large masses absorbing the rotational energy upon collision with the sensor. Conventional measuring elements are resistive, capacitive, electromagnetic, photoelectric, and penumatic or hydraulic. Novel types of angular accelerometers are based on inertia of gas jets, electron beams, and ion beams, the piezoelectric effect in p-n junctions of diode and transistors, the electrokinetic effect in fluids, and cryogenic suspension of the sensor. E.A.K.

N85-28174# Joint Publications Research Service, Arlington, Va.
TECHNOLOGICAL APPARATUS FOR LASER TREATMENT OF MATERIALS Abstract Only **c36**
A. V. Kirillin, A. V. Kostanovskiy, and V. L. Vinogradov *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-85-004) 15 May 1985 p 97 Transl. into ENGLISH from Teplofiz. Vysokikh Temp. (Moscow), v. 22, no. 6, May - Jun. 1984 p 1200-1205 (For primary document see N85-28142 17-31)
Avail: NTIS HC A06/MF A01

An apparatus was developed for technological laser treatment of materials, specifically nonmetallic nitrides which are used as refratory ceramics. The treatment includes remelting into the liquid phase, which occurs at temperatures obove 2000 K and must be done in a nitrogen atmosphere to avoid chemical decomposition. Development of this apparatus was accompanied by a determination of melting temperature-pressure characteristics of most high-temperature nonmetallic nitrides. A high-pressure chamber for treatment of solid material in buffer gas under pressures up to 200 MPa with horizontal entrance of laser beams and a low-pressure chamber for treatment of powdered material under pressures up to 20 MPa with vertical entrance of laser beam are part of the appratus. The apparatus can be used for experimental research on chemically pure surfaces at 5000-6000 K under vacuum or in various gaseous atmospheres. It is used for study of laser treatment of aluminum nitrides, with X-ray phase analysis, X-ray structural analysis, and electron-microscope examination. E.A.K.

N85-28175# Joint Publications Research Service, Arlington, Va.
APPARATUS FOR MEASURING VELOCITY OF SOUND IN FLUIDS Abstract Only **c35**
D. L. Timrot, M. A. Serednitskaya, and T. D. Chkhikvadze *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-85-004) 15 May 1985 p 98 Transl. into ENGLISH from Toplofiz. Vysokikh Temp. (Moscow), v. 22, no. 3, May - Jun. 1984 p 569-573 (For primary document see N85-28142 17-31)

Avail: NTIS HC A06/MF A01

A universal apparatus was developed for simple and accurate measurement of the velocity of sound in almost any fluid, including a chemically active one. Measurements are made by the fixed-distance pulse passage method. An ultrasonic signal travels through the test fluid betwen two optically treated plane-parallel windows in a hermetically closed quartz cell. The latter is dropped into a glass vessel with circulating thermo-static liquid for low-temperature measurments or into an electric furnance for high-temperature measurements. The temperature is measured with a resistance thermometer and read on a digital voltmeter, constancy of the temperature is also monitored on an oscillograph. The velocity of sound is determined on the basis of absolute measurement of the pulse travel time or on the basis of relative measurement. Absolute velocity measurement also requires correction for diffraction, especially in the Fresnel near-field region, which must be subtracted from the velocity reading to yield the true thermodynamic velocity of sound. A significant systematic error of both absolute and relative measurements, in addition to the errors of distance and time measurements, is the error in referring the readings to specific state parameters. E.A.K.

N85-28176# Joint Publications Research Service, Arlington, Va.
LIQUID-METAL TRANSDUCERS FOR STRAIN MEASUREMENT DURING IN-PILE MATERIALS TESTING Abstract Only c35
V. A. Neverov and Yu. L. Revyakin *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-85-004) 15 May 1985 p 98-99 Transl. into ENGLISH from Atomnaya Energ. (Moscow), v. 57, no. 5, Nov. 1984 p 349-353 (For primary document see N85-28142 17-31)
Avail: NTIS HC A06/MF A01

Liquid-metal transducers are proposed for the study of material deformation. The liquid metal must not wet and corrode surrounding solid container surfaces and must have a small cross section for activation interaction with reactor neutrons so as to minimize transmutation into other elements with very different density. These requirements are satisfied by molten tin gallium, indium, and at still higher temperatures by the eutectic lead-bismuth alloy. Transducers using a column of such a metal can convert small changes in the radius of tubular material specimens to large displacements of the liquid column, but they require a high degree of temperature stabilization but also appropriate calibration and correction for the effect internal gauge pressure on axial-radial strains. The transducer chamber must therefore be designed with an inside diameter matching the initial outside diameter and the gauge height of the tubular material specimen. E.A.K.

N85-28177# Joint Publications Research Service, Arlington, Va.
EAST EUROPE REPORT: SCIENCE AND TECHNOLOGY
2 May 1985 90 p Transl. into ENGLISH from various East European articles
(JPRS-ESA-85-017) Avail: NTIS HC A05/MF A01

Numerous scientific and technical developments in East Germany and Hungary are discussed. A proton induced X-ray emission analysis method, vacuum engineering devices, electron spectroscopy, microelectronics, production of integrated circuits and metal oxide semiconductors, and computers are among the topics covered. For individual titles, see N85-28178 through N85-28182.

N85-28178# Joint Publications Research Service, Arlington, Va.
PROTON INDUCED X-RAY EMISSION METHOD, ITS APPLICATION IN ANALYTICS c72
Gyula Szabo *In its* East Europe Rept.: Sci. and Technol. (JPRS-ESA-85-017) 2 May 1985 p 21-23 Transl. into ENGLISH from Finomech., Mikrotech. (Budapest), no. 6, Jun. 1984 p 161-164 Presented at the Seminar on Vacuum Technol. and Anal., Budapest, 20 Feb. 1984 (For primary document see N85-28177 17-31)
Avail: NTIS HC A05/MF A01

The proton induced X-ray emission method (PIXE) is a highly sensitive trace element analytic procedure which can be used on a broad scale. The physical bases and characteristic features of the method are summarized. Its applicability in various scientific areas and a few special procedures is discussed. The measurement procedure realized at ATOMKI (Nuclear Research Institute) and the results achieved thus far are discussed. R.J.F.

N85-28179# Joint Publications Research Service, Arlington, Va.
GOALS, ACHIEVEMENTS OF MICROELECTRONICS PROGRAM c33
Laszlo Schronk *In its* East Europe Rept.: Sci. and Technol. (JPRS-ESA-85-017) 2 May 1985 p 28-35 Transl. into ENGLISH from Meres es Autom. (Budapest), no. 11, 1984 p 426-429 (For primary document see N85-28177 17-31)
Avail: NTIS HC A05/MF A01

Besides reviewing the objectives of the government's microelectronics program, the Microelectronics Enterprise, the production of metal oxide semiconductors and bipolar integrated-circuit chips, specific research and development results to date, and the plans for future activity are discussed. Marketing and domestic demand are discussed. R.J.F.

N85-28180# Joint Publications Research Service, Arlington, Va.
USES OF, EXPERIENCES IN PRODUCTION OF CUSTOM DESIGNED IC'S c33
Ferenc Heksch *In its* East Europe Rept.: Sci. and Technol. (JPRS-ESA-85-017) 2 May 1985 p 41-48 Transl. into ENGLISH from Meres es Autom. (Budapest), no. 11, 1984 p 399-405 (For primary document see N85-28177 17-31)
Avail: NTIS HC A05/MF A01

An analysis is given of the complex theme of custom designed and integrated circuits. The necessary information and the factors influencing the user manufacturere interface are reviewed and the potential of custom designed circuits of the MEV (Microelectronics Enterprise) is discussed. R.J.F.

N85-28181# Joint Publications Research Service, Arlington, Va.
MODERN EQUIPMENT FOR MANUFACTURE OF IC'S IN HUNGARY c33
Janos Erdelyi *In its* East Europe Rept.: Sci. and Technol. (JPRS-ESA-85-017) 2 May 1985 p 49-54 Transl. into ENGLISH from Meres es Autom. (Budapest), no. 11, 1984 p 412-417 (For primary document see N85-28177 17-31)
Avail: NTIS HC A05/MF A01

A significant microelectronics investment is being realized at this time in the interest of improving the supply of parts to the domestic electronics industry. Machine lines to manufacture metal oxide semiconductors integrated circuit elements (chips) were put into operation and the mass production of chips began after successful test operation. Installation of machines to manufacture bipolar IC chips began this year as well. According to plans, mass manufacture on these machine lines will begin in 1985. The moderness of the machines installed can be considered of interest; this determines fundamentally (but not exclusively) the economical manufacture and the modernness of the integrated circuits which can be manufactured. R.J.F.

N85-28182# Joint Publications Research Service, Arlington, Va.
PROGRESS, GOALS IN BIOTECHNOLOGY SUMMARIZED c51
In its East Europe Rept.: Sci. and Technol. (JPRS-ESA-85-017) 2 May 1985 p 54-56 Transl. into ENGLISH from Nepszabadsag (Budapest), 13 Mar. 1985 p 5 (For primary document see N85-28177 17-31)
Avail: NTIS HC A05/MF A01

A review of the progress and goals of Hungary's Biotechnology industries is given. Medical products, vaccines, antibiotics, industrial fructose syrups, and single cell proteins are being marketed. The training of biotechnical specialists and scholars is discussed. R.J.F.

N85-28183# Joint Publications Research Service, Arlington, Va.
WEST EUROPE REPORT: SCIENCE AND TECHNOLOGY
10 Jul. 1984 72 p Transl. into ENGLISH from various West European articles
(JPRS-WST-84-024) Avail: NTIS HC A04/MF A01

Various technical and scientific projects taking place in Western Europe are discussed. Research is cited in such areas

as composite materials, the use of the Ariane launch vehicle to deploy satellites, the use of robots in automobile production, and the funding of the European Airbus. For individual titles, see N85-28184 through N85-28187.

N85-28184# Joint Publications Research Service, Arlington, Va.
FINLAND, SWEDEN COOPERATE IN COMPOSITES RESEARCH **c24**
In its West Europe Rept.: Sci. and Technol. (JPRS-WST-84-024) 10 Jul. 1984 p 1-3 Transl. into ENGLISH from Plastforum Scand. (Helsingborg), no. 5, 1984 p 46 (For primary document see N85-28183 17-31)
Avail: NTIS HC A04/MF A01

The structure and properties of different glass fibers was investigated. The usefulness of different glass fibers and glass fiber filler mixtures as reinforcing material in thermoplastics, as sandwiching material in various laminated constructions, as reinforcement in thermoset plastics and as a supplement in the structure of porous fiberglass bonding agents (fiberglass wool) was studied. Adhesion promotors and bonding materials, primarily for thermoplastics but also for thermoset plastic composites were developed, as well as a method for measuring adhesion between thermoplastic polymers, fiberglass and filling agents. A method for determining critical length of fiber for reinforcing material was also developed. New production methods and semi-finished product methods for the manufacture of thermoplastic composite material containing fibers and filling agents were studied. R.J.F.

N85-28185# Joint Publications Research Service, Arlington, Va.
STRUCTURE OF SYLDA DOUBLE LAUNCH SYSTEM FOR ARIANE **c18**
F. Chanut and M. Richard *In its* West Europe Rept.: Sci. and Technol. (JPRS-WST-84-024) 10 Jul. 1984 p 4-16 Transl. into ENGLISH from L'Aeron. et l'Astron. (Paris), no. 105, 1984 p 18-23 (For primary document see N85-28183 17-31)
Avail: NTIS HC A04/MF A01

The Ariane launcher can simultaneously place into orbit two independent satellites whose masses and volumes are equivalent to those of the satellites launched by Thor Delta or by the Space Shuttle using PAM-D [payload assist module D]. The device used for that purpose is a special adapter called SYLDA (Ariane double launch system). The SYLDA architecture was designed to take into account the requirements and constraints imposed, on the one hand, by the satellites and, on the other hand, by the prelaunching stages and the separation sequence when the satellites are placed into orbit. The selection of materials and the dimensions of the structure reflect mainly mass, ridigity and strength requirements. The manufacturing and control processes were chosen as a function of the characteristics peculiar to the SYLDA structure and the high level of quality required. The static and dynamic performances of the structure were checked through tests, the results of which confirmed the designed values. Author

N85-28186# Joint Publications Research Service, Arlington, Va.
ROBOTS, AUTOMATIC DEVICES INSIDE VW'S WOLFSBURG PLANT **c37**
In its West Europe Rept.: Sci. and Technol. (JPRS-WST-84-024) 10 Jul. 1984 p 34-37 Transl. into ENGLISH from Roboter (Landsberg), Mar. 1984 p 14-16 (For primary document see N85-28183 17-31)
Avail: NTIS HC A04/MF A01

The use of robots at the Volkswagon (VW) Worfsburk plant is discussed. Robots work intensively on the body shell. In the assmebly hall for the new Golf, 4,300 people and only 42 home-built robots work hand in hand. Everything is turned upside-down, in the conveyor systems. While engines and components are being automatically assembled into subassemblies on the ground floor, automated body assembly, a reality for the first time, is taking place on the upper floor. About 380 bolted and fitted joints are made with special machines. However, and this is new, tested robot elements are used for these pieces of equipment, from disc drive to control. Robots carry out heavy and sometimes complicated work without expensive sensors. R.J.F.

N85-28187# Joint Publications Research Service, Arlington, Va.
FUTURE DIRECTIONS OF ROBOTICS, AUTOMATION IN ITALY **c37**
Antonio Strumia *In its* West Europe Rept.: Sci. and Technol. (JPRS-WST-84-024) 10 Jul. 1984 p 38-41 Transl. into ENGLISH from ATA Ing. Automotoristica (Turin), Feb. 1984 p 123-126 (For primary document see N85-28183 17-31)
Avail: NTIS HC A04/MF A01

The use of robots in Italy is discussed. Robots are rarely being used in Italian industry due to lack of investment by both government and industry. A number of areas in which robots would be useful are cited. R.J.F.

N85-28188# Joint Publications Research Service, Arlington, Va.
USSR REPORT: MACHINE TOOLS AND METALWORKING EQUIPMENT
31 Jul. 1984 59 p Transl. into ENGLISH from various Russian articles
(JPRS-UMM-84-014) Copyright. Avail: NTIS HC A04

Progress in the development of machine tools and metal working equipment is reported. Topics discussed include: industry planning and economics, metal cutting and metal forming machine tools, robotics, and process controls and automation electronics. For individual titles, see N85-28189 through N85-28189.

N85-28189# Joint Publications Research Service, Arlington, Va.
APPLICATIONS OF ROBOTS IN MACHINE TOOL INDUSTRY REVIEWED
Nikolay Tyurin *In its* USSR Rept.: Machine Tools and Metalworking Equipment (JPRS-UMM-84-014) 31 Jul. 1984 p 46-49 Transl. into ENGLISH from Sov. Rossiya (Moscow), 28 Apr. 1984 p 1 (For primary document see N85-28188 17-31)
Avail: NTIS HC A04

Progress in the development of the application of robots in the machine tool industry is reported. The implementation of major comprehensive programs will raise the production to a new level. Robot technology and the development of its major resource is emphasized. E.A.K.

32 COMMUNICATIONS

Includes land and global communications; communications theory; and optical communications.

For related information see also *04 Aircraft Communications and Navigation* and *17 Spacecraft Communications, Command and Tracking.*

N85-28190*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
PERFORMANCE ANALYSIS OF THE DSN BASEBAND ASSEMBLY (BBA) REAL-TIME COMBINER (RTC)
Marvin K. Simon and Alex Mileant 1 May 1985 53 p Revised (Contract NAS7-918)
(NASA-CR-175878; JPL-Pub-84-94-Rev-1; NAS 1.26:175878)
Avail: NTIS HC A04/MF A01 CSCL 17B

The operation of the BBA Real Time Combiner (RTC) is discussed and its performance investigated in detail. It is shown that each channel of the RTC can be modelled by a simple block diagram in the z-transform domain from which all pertinent transient and steady state behavioral characteristics can be determined. In particular, the characteristic equation of the tracking loop and its equivalent noise bandwidth are found and used to evaluate the closed loop transient response and steady-state mean squared timing jitter. The impact of the totality of these loop jitter contributions on the combiner output SNR is evaluated and illustrated numerically. These results show that for parameters of interest to various space missions, the RTC is capable of providing significant SNR improvement relative to a single receiving antenna. Author

N85-28191*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
MICROWAVE RESPONSES OF THE WESTERN NORTH

ATLANTIC
J. M. Stacey and M. A. Girard 15 Feb. 1985 35 p ref Original contains color illustrations
(Contract NAS7-918)
(NASA-CR-175888; JPL-Pub-85-12; NAS 1.26:175888) Avail: NTIS HC A03/MF A01 CSCL 20N

Features and objects in the Western North Atlantic Ocean - the Eastern Seaboard of the United States - are observed from Earth orbit by passive microwaves. The intensities of their radiated flux signatures are measured and displayed in color as a microwave flux image. The features of flux emitting objects such as the course of the Gulf Stream and the occurrence of cold eddies near the Gulf Stream are identified by contoured patterns of relative flux intensities. The flux signatures of ships and their wakes are displayed and discussed. Metal data buoys and aircraft are detected. Signal to clutter ratios and probabilities of detection are computed from their measured irradiances. Theoretical models and the range equations that explain passive microwave detection using the irradiances of natural sources are summarized. Author

N85-28192*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
A SOFTWARE SIMULATION STUDY OF A (255,223) REED-SOLOMON ENCODER-DECODER
Fabrizio Pollara 15 Apr. 1985 43 p refs
(Contract NAS7-918)
(NASA-CR-175872; JPL-Pub-85-23; NAS 1.26:175872) Avail: NTIS HC A03/MF A01 CSCL 17B

A set of software programs which simulates a (255,223) Reed-Solomon encoder/decoder pair is described. The transform decoder algorithm uses a modified Euclid algorithm, and closely follows the pipeline architecture proposed for the hardware decoder. Uncorrectable error patterns are detected by a simple test, and the inverse transform is computed by a finite field FFT. Numerical examples of the decoder operation are given for some test codewords, with and without errors. The use of the software package is briefly described. Author

N85-28193*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
PERFORMANCE ANALYSIS OF THE DSN BASEBAND ASSEMBLY (BBA) REAL-TIME COMBINER (RTC)
Marvin K. Simon and Alex Milean 15 Dec. 1984 52 p
(Contract NAS7-918)
(NASA-CR-175877; JPL-Pub-84-94; NAS 1.26:175877) Avail: NTIS HC A04/MF A01 CSCL 17B

The operation of the BBA Real Time Combiner (RTC) is discussed and its performance investigated in detail. It is shown that each channel of the RTC can be modelled by a simple block diagram in the z-transform domain from which all pertinent transient and steady state behavioral characteristics can be determined. In particular, the characteristic equation of the tracking loop and its equivalent noise bandwidth are found and used to evaluate the closed loop transient response and steady state mean squared timing jitter. The impact of the totality of these loop jitter contributions on the combiner output SNR is evaluated and illustrated numerically. These results show that for parameters of interest to various space missions, the RTC is capable of providing significant SNR improvement relative to a single receiving antenna. Author

N85-28194*# Bendix Corp., Mishawaka, Ind. Guidance Systems Div.
HARDWARE TEST PROGRAM FOR EVALUATION OF BASELINE RANGE/RANGE RATE SENSOR CONCEPT Monthly Progress Report, 12 May - 11 Jun. 1985
11 Jun. 1985 8 p
(Contract NAS8-36144)
(NASA-CR-175910; NAS 1.26:175910) Avail: NTIS HC A02/MF A01 CSCL 17I

The Hardware Test Program for evaluation of the baseline range/range rate sensor concept was initiated 11 September 1984. This ninth report covers the period 12 May through 11 June 1885. A contract amendment adding a second phase has extended the Hardware Test Program through 10 December 1985. The objective of the added program phase is to establish range and range measurement accuracy and radar signature characteristics for a typical spacecraft target. Phase I of the Hardware Test Program was designed to reduce the risks associated with the Range/Range Rate (R/R) Sensor baseline design approach. These risks are associated with achieving the sensor performance required for the two modes of operation, the Interrupted CW (ICW) mode for initial acquisition and tracking to close-in ranges, and the CW mode, providing coverage during the final docking maneuver. The risks associated with these modes of operation have to do with the realization of adequate sensitivity to operate to their individual maximum ranges. B.W.

N85-28195# Aerospace Corp., El Segundo, Calif. Electronics Research Lab.
RADIOMETER INTEGRATED INTO A COMMUNICATION TERMINAL
R. B. Dybdal 5 Feb. 1985 26 p
(Contract F04701-83-C-0084)
(AD-A151746; TR-0084A(5417-01)-1; SD-TR-85-05) Avail: NTIS HC A03/MF A01 CSCL 17/2

Passive radiometric techniques for the measurement of weather-induced propagation loss in real time are well established. As communications systems move to into the extremely high frequency bands, such a real-time indication of link loss would provide terminal operators with availability information, and in addition, a complementary diagnostics capability for terminal performance. A low-cost technique and its design issues to integrate a radiometer into a communications terminal are discussed. The radiometer is designed to work simultaneously with a frequency-dopped communication receiver and provides a real-time measurement of propagation loss, detection and angular location of interference, transmitter power control to reduce excess margin and detectability, and diagnostics which complement typical BITE capability. The cost of the additional hardware for the radiometric capability is low, because the high cost elements are those shared and already an inherent part of the communication terminal. The addition of such a radiometric capability to superhigh frequency/extremely high frequency terminals should be considered in future designs. GRA

N85-28196# Army Communications-Electronics Command, Fort Monmouth, N.J.
A TRANSPORT THEORY OF MILLIMETER WAVE PROPAGATION IN WOODS AND FORESTS Technical Report, Jul. 1982 - Jul. 1984
R. Johnson and F. Schwering Feb. 1985 84 p
(AD-A151883; CECOM-TR-85-1) Avail: NTIS HC A05/MF A01 CSCL 20/14

A theory of mm wave propagation in woods and forests is presented which models the vegetation environment as a statistically homogeneous random medium of scatterers characterized by a scatter function (phase function) with a narrow forward lobe and an omnidirectional background. The model describes the medium in terms of four overall theoretical parameters whose numerical values can be determined in principle by comparison of analytical results and experimental data. The scalar transport theory is used to determine the coherent and incoherent field intensities in the forest medium; the problem solved is that of a vegetation halfspace illuminated by a plane wave. Formulas and graphs are presented on the range dependence of the coherent and incoherent intensities, and on the angular spectrum (beam broadening) of the incoherent intensity. Comparison with experimental results obtained by an independent investigation has shown good qualitative agreement of calculated and measured results. GRA

N85-28197# Lincoln Lab., Mass. Inst. of Tech., Lexington.
WIDEBAND INTEGRATED VOICE/DATA TECHNOLOGY Semiannual Technical Summary Report, 1 Apr. - 30 Sep. 1984
C. J. Weinstein 30 Sep. 1984 61 p
(Contract F19628-85-C-0002; ARPA Order 3673; DA Proj. 3T1-0)

(AD-A152329; ESD-TR-84-284) Avail: NTIS HC A04/MF A01 CSCL 17/2

This report describes work performed on the Wideband Integrated Voice/Data Technology Program sponsored by the Information Processing Techniques Office of the Defense Advanced Research Projects Agency during the period 1 April through 30 September 1984. GRA

N85-28196# Naval Postgraduate School, Monterey, Calif.
LOGICAL DESIGN OF A DECISION SUPPORT SYSTEM TO FORECAST TECHNOLOGY, PRICES AND COSTS FOR THE NATIONAL COMMUNICATIONS SYSTEM M.S. Thesis
K. A. Williams and E. C. Partridge, III Sep. 1984 112 p
(AD-A152330) Avail: NTIS HC A06/MF A01 CSCL 17/2

Originally envisioned as a means to integrate the many systems found throughout the government, the general mission of the NCS continues to be to ensure the survivability of communications during and subsequent to any national emergency. In order to accomplish this mission the NCS is an arrangement of heterogeneous telecommunications systems which are provided by their sponsor Federal agencies. The physical components of Federal telecommunications systems and networks include telephone and digital data switching facilities and primary common user communications centers; Special purpose local delivery message switching and exchange facilities; Government owned or leased radio systems; Technical control facilities which are under exclusive control of a government agency. This thesis describes the logical design of a proposed decision support system for use by the National Communications System in forecasting technology, prices, and costs. It is general in nature and only includes those forecasting models which are suitable for computer implementation. Because it is a logical design it can be coded and applied in many different hardware and/or software configurations. GRA

N85-28199# Federal Aviation Administration, Washington, D.C. Associate Administrator for Development and Logistics.
FAA (FEDERAL AVIATION ADMINISTRATION) ASSESSMENT OF SATELLITE CONCEPTS AND AVIATION SPECTRUM REQUIREMENTS
R. F. Bock, A. Buige, V. E. Foose, R. Johnson, and R. M. Kalafus Feb. 1985 98 p
(AD-A152338; FAA/DL-85-2) Avail: NTIS HC A05/MF A01 CSCL 17/2

This report documents an FAA effort that identified aeronautical safety related air-ground services that might be provided in the future by satellite services, made estimates of L-band frequency spectrum for these satellites, and developed an approach and conditions for sharing satellite services with other users. GRA

N85-28200# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
THE R-609 RADIO SET
S. Ronzhin 19 Feb. 1985 10 p Transl. into ENGLISH from Radio (USSR), no. 9, 1971 p 14-16
(AD-A152370; AD-E900434; FTD-ID(RS)T-0543-84) Avail: NTIS HC A02/MF A01 CSCL 17/2

The R-609 radio set is intended for simplex telephone communication in the frequency range from 100 to 150 MHz with the setting of the operating frequencies of the transmitter and receiver by interchangeable crystals. The set can be preliminary tuned in this range on any four operating frequencies and search-free communication carried out on them. Switching from one communication channel to another is realized automatically by pressing the appropriate button on the control panel or on the measuring unit, for which no more than three seconds are required. Thirty crystals each for the transmitter and the receiver are usually attached to the operating set of the station. The radio set utilizes a wide-band discone antenna, ensuring communication in the entire range of frequencies, or a half-wave vibrator. The radio set is powered from an alternating current network with a voltage of 110, 127 ro 220 V, and also from an on-board direct current network through a voltage converter of the types OP-120 and AMG-3. GRA

N85-28201# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
MOBILE TELEVISION RADIO LINK
V. N. Vinogradov and G. V. Yablokov 8 Mar. 1985 12 p Transl. into ENGLISH from Vestnik Svyazi (USSR), no. 4, Apr. 1971 p 7-9
(AD-A152381; AD-E900434; FTD-ID(RS)T-0563-84) Avail: NTIS HC A02/MF A01 CSCL 17/2

The new radio link is intended for the transmission of signals of a television image (black-white and color) and a two-program sound accompaniment. The radio link can be used both during operation with mobile television stations and with fixed variant (SRL-11). This is necessary, for example, for the transmission of signals of television and sound accompaniment in the case of a separated variant of the television center (the ASK and RPS are located at separate sites); for the transmission of signals to television relays by means of branching from radio-relay main line; for television relay points (from theaters, palaces, concert halls, videotelephones, etc.). The equipment of the radio link ensures the steady transmission of signals for a distance up to 50 km without an intermediate relay at any time of the year and day with the compulsory absence of obstacles in the Fresnel zone and a power of I W for the radio transmitter. The equipment of the radio link operates in the frequency ranges of 7550-7750 and 8500-8700 MHz, in which 10 radio channels are found. The number of radio links operating simultaneously is six. The radio transmitters of the radio link can be removed up to a distance of 300 m from the transmitter control and power supply units. GRA

N85-28202# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
DIGITAL METHODS OF THE OPTIMUM PROCESSING OF RADAR SIGNALS
S. V. Samsonenko 7 Feb. 1985 527 p Transl. into ENGLISH of the book "Tsifrovyye Metody Optimalnoy Obrabotki Radiolokatsionnykh Signalov" Moscow, Voyennoye, 1968 p 1-319
(AD-A152469; AD-E440273; FTD-ID(RS)T-0667-84) Avail: NTIS HC A23/MF A01 CSCL 17/9

In book questions of use/application of digital computers for optimum processing of radar signals are examined. Primary attention is given to the detection of signals from the targets, hidden by interferences, and to the determination of the target coordinates. Is described the work of the simplest diagrams of working/treatment, their operating principle, and also work of some nodes of digital computers. Subsequently are given the more complicated cases, special theory and algorithms of working/treatment. Shows how it is realized the synthesis of the structures of machines and their algorithms on the base of the theory of statistical solutions. The necessary information according to the theory of statistical solutions is given on the course of presentation. Book is intended for cabets of military colleges, students of military academies, military engineers and can be used by civil/civilian specialists, who work in the region of radar. GRA

N85-28203# Zeger-Abrams, Inc., Glenside, Pa.
ADAPTIVE NULLING AT HF USING A COMPACT ARRAY OF ACTIVE PARASITIC ANTENNAS Final Technical Report, Sep. 1978 - Mar. 1984
T. E. Jones and A. E. Zeger Mar. 1985 161 p
(Contract N00173-78-C-0265)
(AD-A152582; R85-NRL-1) Avail: NTIS HC A08/MF A01 CSCL 09/5

This parasitic array is a promising method of building an adaptive array in a tiny aperture. This is particularly attractive for HF. Both theory and experimental results are presented. The theory is established with respect to two models of a compact array, an impedance model and a transmission line model. The relationship between the models are derived. The models are then used to explore the null forming and adaptive control, with an emphasis on active terminations. Zeger-Abrams designed an electronically variable active termination. Experimental results were obtained from an array of both passive and active terminations. Empirical results with active complex-valued terminations demonstrated the feasibil-

ity of simultaneously nulling multiple HF jammers with an adaptively controlled compact array having parasitic auxilliary elements and an unweighted main antenna. Finally, an algorithm to adaptively control the active terminations is derived. GRA

N85-28204# Naval Postgraduate School, Monterey, Calif.
AN ANALYSIS OF THE ECONOMIC IMPACT OF THE AN/APS-134 FLAR (FORWARD LOOKING AIRBORNE RADAR) RETROFIT ON COAST GUARD HC-130 AIRCRAFT M.S. Thesis
R. E. Dunn Dec. 1984 103 p
(AD-A152619) Avail: NTIS HC A06/MF A01 CSCL 17/9

Concern over the growing drug smuggling problem and improved national defense capability are manifest in the need for a new forward looking airborne radar (FLAR) for Coast Guard HC-130 aircraft, with a capability of detecting a target of 1 square meter radar cross section. This thesis reexamines the analysis that selected the AN/APS-134 FLAR over other contenders based on mission need, radar performance and life cycle cost criteria. This thesis presents a better understanding of the resulting HC-130 force structure based on the impact of FLAR technology. GRA

N85-28205# Naval Postgraduate School, Monterey, Calif.
ANGULAR TRACKING ERROR IN A PHASE COMPARISON MONOPULSE TRACKING RADAR: A CRITICAL REVIEW AND EXTENSION OF THE PHASE FRONT DISTORTION APPROACH M.S. Thesis
S. Bumroongpol Dec. 1984 42 p
(AD-A152628) Avail: NTIS HC A03/MF A01 CSCL 17/9

This thesis studies the inherent angular errors of a phase comparison monopulse system used for tracking a complex target. The phase compensation equation is utilized in justifying Howard's hypothesis on the relationship between the phase front distortion of the scattered wave from a complex target and angular tracking errors, in extending this hypothesis to closer ranges to the target, and in determining the limitations of this hypothesis. Through the phase compensation equation, global errors are demonstrated. A Local error bound is also determined for the tracking of a two element target. These new results are not predicted by Howard's hypothesis. GRA

N85-28206# Naval Postgraduate School, Monterey, Calif.
THE WEIGHTING FUNCTION FOR SCINTILLATION ON A FOLDED PATH M.S. Thesis
B. G. An Dec. 1984 64 p
(AD-A152659) Avail: NTIS HC A04/MF A01 CSCL 20/6

In the case of a spherical beam wave propagating in a weakly inhomogeneous medium which has a Kolmogorov spectrum, Dr. Ze'evi derived a weighting function for scintillation for a direct and for a folded path with respect to the position of the turbulent medium. Experiments were performed to verify Ze'evi's weighting function for a folded path for three different types of reflectors. The experimental results did not support Dr. Ze'evi's theory. We found that the scintillation weighting functions are less weighted near the detector and have an unexpected increase near the reflector. These results are discussed by using a geometric optical model of the turbulence. GRA

N85-28207# University Coll. of Wales, Aberystwyth. Dept. of Physics.
SCINTILLATION USING NNSS SATELLITES Final Report, 1 Dec. 1983 - 30 Nov. 1984
L. Kersley and N. S. Wheadon 31 Jan. 1985 24 p
(Grant AF-AFOSR-0037-84)
(AD-A152804; AFGL-TR-85-0053) Avail: NTIS HC A02/MF A01 CSCL 20/14

An experiment to study radio-wave scintillations and ionospheric irregularities at high latitudes is described. This involves the routine monitoring of transmission from NNSS satellites from a site in northern Scandinavia, and incorporates coordinated observations with the EISCAT ionospheric radar facility. Some early results, obtained following deployment of the equipment in September 1984, are presented. GRA

N85-28208# Naval Research Lab., Washington, D. C.
RATIONAL PULSE-SHAPING FILTERS FOR ALMOST MSK-LIKE MODULATION Interim Report, May 1981 - Oct. 1984
J. O. Coleman 22 Mar. 1985 33 p
(AD-A153065; NRL-8871) Avail: NTIS HC A03/MF A01 CSCL 09/6

MSK-like data-formulation formats are those for which: (1) the instantaneous phase of the transmitted signal changes by exactly 90 deg in each bit interval; (2) the envelope of the transmitted signal is constant; and (3) the power spectrum of the transmitted signal rolls off asymptotically faster than the spectrum of ordinary (rectangular or unfiltered) QPSK. Well-known members of this family include MSK (minimum-shift keying), SFSK (sinusoidal frequency-shift keying), and DSFSK (doubly sinusiodal frequency-shift keying). These modulation types are well suited both to data communication and to radar pulse compression using binary code sequences. Unfortunately, most MSK-like formats have complex implementations. In this report, new modulation formats are described which come close to being in the MSK-like class, yet are inherently simple to implement using baseband pulse-shaping filters with low-order rational transfer functions. GRA

N85-28209# IIT Research Inst., Chicago, Ill.
ELF (EXTREMELY LOW FREQUENCY) COMMUNICATIONS SYSTEM ECOLOGICAL MONITORING PROGRAM: MEASUREMENTS OF ELF ELECTROMAGNETIC FIELDS FOR SITE SELECTION AND CHARACTERIZATION, 1983
J. O. Enk and J. R. Gauger Jan. 1985 122 p
(Contracts N00039-84-C-0070; N00039-81-C-0357)
(AD-A153120; IITRI-E06549-10) Avail: NTIS HC A06/MF A01 CSCL 06/19

A long-term program for studying possible effects from the operation of the Navy's ELF Communications System is being conducted on biota and ecosystems components in northwestern Wisconsin and the Upper Peninsula of Michigan. Sixteen general types of organisms from three major ecosystems in ELF system areas are being examined. Formulation of an ELF Ecological Monitoring Program was completed in early 1982 by the Department of the Navy. Monitoring studies were conducted through a peer-reviewed, competitive bidding process in mid-1982, and studies were initiated in late summer. Major activities of the program during 1983 consisted of characterization of critical aspects of each study, collection of data to validate assumption made in proposals, and selection of study sites. Measurements of electromagnetic fields at the investigator-selected sites are documented, and the acceptability and status of the sites in light of the electromagnetic exposure criteria are discussed. GRA

N85-28210# Syracuse Univ., N. Y. Dept. of Electrical and Computer Engineering.
ELECTROMAGNETIC TRANSMISSION THROUGH A SLOT IN A PERFECTLY CONDUCTING PLANE Interim Technical Report
J. R. Mautz and R. F. Harrington Dec. 1984 31 p
(Contract DAAG29-84-K-0078)
(AD-A153224; SYRU/DECE/TR-84/9; ARO-21378.1-EL) Avail: NTIS HC A03/MF A01 CSCL 20/14

When a plane wave is incident on a slot in a perfectly conducting ground plane of infinite extent, three quantities of interest are the tangential electric field in the aperture, the transmission coefficient, and the scattering cross section. It is assumed that the tangential electric field in the aperture is transverse to the slot axis and depends only on the coordinate along the slot axis. A computer program is presented to calculate the tangential electric field in the aperture, the transmission coefficient, and the scattering cross section. This program is described and listed. Sample input and output data are included for the convenience of the user. GRA

N85-28211# Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.

A STUDY OF ERROR RATES IN VOICE RECOGNITION Technical Report
J. S. Ballmann Feb. 1985 14 p
(DA Proj. 718-4)
(AD-A153282; AFAMRL-TP-85-300) Avail: NTIS HC A02/MF A01 CSCL 17/2

Voice recognition as a means of data entry was evaluated by measuring error rates of words in a test vocabulary. When the words are divided into groups based on certain phonetic characteristics, significant differences in error rate were found between the groups. Two rules were proposed as an aid in selecting commands to system designers contemplating use of voice recognition. GRA

N85-28212# Royal Signals and Radar Establishment, Malvern (England).
MOON BOUNCE COMMUNICATIONS TO SMALL TERMINALS
G. E. James Oct. 1984 10 p
(AD-A153297; RSRE-MEMO-3765; DRIC-BR-94189) Avail: NTIS HC A02/MF A01 CSCL 17/2

The object of this study is to investigate the feasibility of communications from a large fixed Earth station to a small mobile station using moon-reflected signals. A review of the technical problems is presented, and recommendations made on the choice of operating frequency, modulation type and equipment. Suggestions are made for practical trails, using equipment which is already in existence at RSRE Defford. GRA

N85-28213# Department of the Air Force, Washington, D.C.
SURVIVABLE GROUND BASE SENSOR Patent Application
G. W. Randig, inventor (to Air Force) Filed 26 Feb. 1985 64 p
(AD-D011647; US-Patent-Appl-SN-705827) Avail: NTIS HC A04/MF A01 CSCL 17/9

The survivable ground base sensor is the basic element of a land-based distributed radar that consists of 60 or more individual subarrays, which are located in either a straight line or on the perimeter of a 200 nmi diameter circle in the north central U.S. At least 10 nmi separation is provided between individual subarrays. Each subarray is self-contained with emergency power and is operated unattended. There is no need for any interconnection between subarrays so that the survivability is improved, and there is no limit to the number of subarrays used except that imposed by cost and the desire for greater survivability. Since the spacing between subarrays is 10 nmi, a direct hit on one subarray will not damage an adjacent one so that a separate re-entry vehicles must be targeted to each subarray. Author (GRA)

N85-28214# Center for Mathematics and Computer Science, Amsterdam (Netherlands). Dept. of Computer Science.
ALGEBRA OF COMMUNICATING PROCESSES
J. A. Bergstra and J. W. Klop Nov. 1984 46 p refs Submitted for publication
(CWI-CS-R8421; B8478818) Avail: NTIS HC A03/MF A01

Process algebra including merging processes without communication, merging process with communication, data flow network, regular processes, recursively defined processes, and abstraction mechanisms in absence and presence of communication is reviewed. Equational specifications and graph theoretical models are discussed. Author (ESA)

N85-28215# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Oberpfaffenhofen (West Germany). Inst. fuer Physik der Atmosphaere.
STATISTICAL COMPARISON OF RADAR ECHOES OF CONVECTIVE PRECIPITATION BETWEEN THE NORTHERN ALPS AND ITS FORELAND
Anton Singler Dec. 1984 20 p refs In GERMAN; ENGLISH summary
(DFVLR-FB-85-07; ISSN-0171-1342) Avail: NTIS HC A02/MF A01; DFVLR, Cologne DM 9

The echofrequency of showers and thunderstorms for 100 sq km, measured by radar, is used as a parameter of convective activity of a region. The position of the DFVLR weather radar (3.2 cm wave length) near the Alps with plain regions in the northern part of its panorama range and mountain areas in the south allows comparisons or quantitative calculations of the echo frequency in these orographic regions. The evaluations of radar measurements show an enhancement of convective precipitation activity in the alpine region compared with the northern plain areas within the radar range. Author (ESA)

N85-28216# Aeromaritime Systembau G.m.b.H., Munich (West Germany). Bereich: Ingenieurwesen.
DEVELOPMENT OF A MICROPROCESSOR CONTROLLED COMMUNICATION SYSTEM FOR SHIPS Final Report, Jan. 1983
Ruediger Hempfling Bonn Bundesministerium fuer Forschung und Technologie Dec. 1984 51 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-84-275; ISSN-0340-7608) Avail: NTIS HC A04/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 11.50

A breadboard model of a computer controlled shipborne communication system was developed and tested. This system includes an analog switching unit where time multiplex techniques are applied, several types of audio units with analog/digital parts keyboards and displays, and a central processing unit. The system programming was established. The test results demonstrate that the development phase is successfully completed. Author (ESA)

N85-28217# Ruhr Univ., Bochum (West Germany). Inst. fuer Hoch- und Hoechstfrequenztechnik.
IONOSPHERIC EFFECTS ON ANTENNA IMPEDANCE Final Report, Dec. 1980
Karl-Heinz Bethke Bonn Bundesministerium fuer Forschung und Technologie Dec. 1984 25 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-W-84-052; ISSN-0170-1339) Avail: NTIS HC A02/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 5.50

The reciprocity between high power satellite antennas and the surrounding plasma are examined. The relevant plasma states for antenna impedance calculations are presented and plasma models, and hydrodynamic and kinetic theory, are discussed. A theory from which a variation in antenna impedance with regard to the radiated power can be calculated for a frequency range well above the plasma resonance frequency is given. The theory can include photo and secondary emission effects in antenna impedance calculations. Author (ESA)

33 ELECTRONICS AND ELECTRICAL ENGINEERING

Includes test equipment and maintainability; components, e.g., tunnel diodes and transistors; microminiaturization; and integrated circuitry.

For related information see also *60 Computer Operations and Hardware* and *76 Solid-State Physics.*

N85-28218 Department of the Air Force, Washington, D.C.
MULTICONDUCTOR FLAT CABLE Patent
E. A. Escallier, S. R. Dawson, and J. M. Shaheen, inventors (to Air Force) Issued 26 Feb. 1985 6 p
(AD-D011635; US-Patent-4,501,929; US-Patent-Appl-SN-586953; US-Patent-Class-174-117F) Avail: US Patent and Trademark Office CSCL 09/1

A multiconductor flat cable incorporates an approximately right angle turn in its conductor runs. The right angle turn is provided by first securing the conductor runs in a desired spacing through a first lamination of insulation cover and base sheets while leaving portions of the conductor runs exposed through a window in the first lamination. The first lamination is then severed at the lateral edges of the window so that the end portion of the first lamination

may be moved ninety degrees relative to a remaining body portion thereto. The right angle turn is then secured by forming a second lamination with cover and base layers so as to overlap the first lamination and the turn in the conductor runs. Author (GRA)

N85-28219 Department of the Air Force, Washington, D.C.
HEAT RESISTANT SHEATHED INSULATED ELECTRICAL CONDUCTORS Patent
F. L. Merritt and A. C. Ducati, inventors (to Air Force) Issued 12 Feb. 1985 4 p Supersedes AD-D010862
(AD-D011644; US-Patent-4,499,334; US-Patent-Appl-SN-564547; US-Patent-Class-174-111) Avail: US Patent and Trademark Office CSCL 09/1

The leads to a heater for an electrothermal hydrazine monopropellant thruster comprise tungsten conductors wrapped with smaller diameter tungsten support wire and insulated with beads of alumina (Al2O3). A transition section connects the leads to regular leads. An attaching support wire is attached to the heater at one end and to the transition section at the other end. The insulated conductors and attaching wire are wrapped together with nickel ribbon to form a sheath. GRA

N85-28220 Department of the Air Force, Washington, D.C.
CUT ANGLES FOR QUARTZ CRYSTAL RESONATORS Patent
A. Kahan, inventor (to Air Force) Issued 12 Feb. 1985 19 p Supersedes AD-D010308
(AD-D011652; US-Patent-4,499,395; US-Patent-Appl-SN-498336; US-Patent-Class-310-361) Avail: US Patent and Trademark Office CSCL 20/2

The present invention concerns itself with crystallographically doubly rotated quartz orientations vibrating in the transverse c-mode with turnover temperatures which are considerably less sensitive to angular misorientation than the comparable well known AT- or BT-cuts. These crystals are arbitrarily designated as AK-cut crystals and are defined by phi-angle variations between 30 deg.-60 deg, and theta-angle variations between 12 deg.-32 deg. The turnover temperatures of these resonators are between 60 deg. C and 200 deg. C. Author (GRA)

N85-28221*# Iveco, Inc., Huntington Beach, Calif.
COMMERCIALIZATION OF THE POWER FACTOR CONTROLLER Final Report
15 Apr. 1981 362 p refs
(Contract NAS8-33465)
(NASA-CR-171500; NAS 1.26:171500) Avail: NTIS HC A16/MF A01 CSCL 09C

The purpose of the Motor Power Controller, also known as the Power Factor Controller, is to improve power factor and reduce power dissipation in induction motors operating below full load. These purposes were studied and tested in detail. The Motor Power Controller is capable of raising power factors from 0.2 to 0.8 and results in energy savings. It was found that many motors, in their present operating applications, are classified as unstable. The electronic nature of the controller vs. the electrical nature of the motor, compound this problem due to the differences in response time of the two devices. Many tests were successfully completed, the most indicating greater savings than anticipated. Also, there was an effect on efficiency which was not included in the calculations. E.R.

N85-28222*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
PERFORMANCE ANALYSIS OF RADIATION COOLED dc TRANSMISSION LINES FOR HIGH POWER SPACE SYSTEMS
Gene E. Schwarze 1985 32 p refs Prepared for presentation at the 20th Intersoc. Energy Conversion Eng. Conf., Miami Beach, Fla., 18-23 Aug. 1985; sponsored in part by SAE, ANS, ASME, IEEE, AIAA, ACS and AIChE
(NASA-TM-87040; E-2596; NAS 1.15:87040) Avail: NTIS HC A03/MF A01 CSCL 09C

As space power levels increase to meet mission objectives and also as the transmission distance between power source and load increases, the mass, volume, power loss, and operating voltage and temperature become important system design considerations. This analysis develops the dependence of the specific mass and percent power loss on hte power and voltage levels, transmission distance, operating temperature and conductor material properties. Only radiation cooling is considered since the transmission line is assumed to operate in a space environment. The results show that the limiting conditions for achieving low specific mass, percent power loss, and volume for a space-type dc transmission line are the permissible transmission voltage and operating temperature. Other means to achieve low specific mass include the judicious choice of conductor materials. The results of this analysis should be immediately applicable to power system trade-off studies including comparisons with ac transmission systems. Author

N85-28223# Defence Science and Technology Organization, Salisbury (Australia). Weapons Systems Research Lab.
VLSI WORKSHOP AND PROJECT: FEBRUARY - NOVEMBER 1982 Final Report
J. Hayward Sep. 1984 111 p
(WSRL-0374-TR; AR-004-105) Avail: NTIS HC A06/MF A01

At regular intervals, the CSIRO VLSI Program coordinates the production of multiproject very large scale integrated circuit chips, in n-mos technology, using the Mead-Conway design method. The author attended the first Workshop conducted in support this activity, and designed a successful digital circuit project which became part of the first such chip. The Workshop, the project, the circuit design, the performance estimation and measured performance are described. Also covered the difficulties encountered in transfering the computer software design tools, supplied by the Program in a form suitable for the VAX computer operating system, to the main-frame IBM 3033 system in use at DRCS. Author

N85-28224*# Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Electrical Engineering.
ACOUSTOOPTIC PULSE-ECHO TRANSDUCER SYSTEM
Richard O. Claus and Janet C. Wade (Jones, (J. A.) Applied Research Co.) 30 Sep. 1983 21 p refs
(Grant NAG1-263)
(NASA-CR-175919; NAS 1.26:175919) Avail: NTIS HC A02/MF A01 CSCL 09A

A pulse-echo transducer system which uses an ultrasonic generating element and an optical detection technique is described. The transmitting transducer consists of a concentric ring electrode pattern deposited on a circular, X-cut quartz substrate with a circular hole in the center. The rings are independently pulsed with a sequence high voltage signals phased in such a way that the ultrasonic waves generated by the separate rings superimpose to produce a composite field which is focused at a controllable distance below the surface of the specimen. The amplitude of the field reflected from this focus position is determined by the local reflection coefficient of the medium at the effective focal point. By processing the signals received for a range of ultrasonic transducer array focal lengths, the system can be used to locate and size anomalies within solids and liquids. Applications in both nondestructive evaluation and biomedical scanning are suggested. Author

N85-28225# Department of the Air Force, Washington, D.C.
PIPELINED PROGRAMMABLE CHARGE DOMAIN DEVICE Patent Application
T. L. Vogelsong, inventor (to Air Force) Filed 7 Dec. 1984 19 p
(AD-D011598; US-Patent-Appl-SN-679332) Avail: NTIS HC A02/MF A01 CSCL 09/1

This patent application discloses programmable signal processing apparatus for multiplying a sampled analog singal by a multiple bit digital word coefficient. All signal processing operations are accomplished by the splitting, routing and combining of charge packets formed in a charge domain device. GRA

N85-28226# Lincoln Lab., Mass. Inst. of Tech., Lexington.
RESTRUCTURABLE VLSI (VERY LARGE SCALE INTEGRA-

TION) PROGRAM Semiannual Technical Summary 1 Apr. - 30 Sep. 1984
G. C. OLeary 30 Sep. 1984 28 p
(Contract F19628-85-C-0002; ARPA Order 3797; AF Proj. 3D30) (AD-A152340; ESD-TR-84-294) Avail: NTIS HC A03/MF A01 CSCL 09/5

This report describes work performed on the Restructurable VLSI Program sponsored by the Information Processing Techniques Office of the Defense Advanced Research Projects Agency during the period 1 April through 30 September 1984. GRA

N85-28227# Michigan Univ., Ann Arbor. Solid-State Electronics Lab.
MEASUREMENT METHODS FOR ACCURATE MICROWAVE CHARACTERIZATION AND MODELING OF MESFET CHIPS Interim Technical Report, 1 Mar. 1981 - 31 Jul. 1984
D. E. Peck Wright-Patterson AFB, Ohio AFWAL Jan. 1985 275 p
(Contract F33615-81-K-1429)
(AD-A152360; TR-171; AFWAL-TR-84-1177) Avail: NTIS HC A12/MF A01 CSCL 09/1

The subject of accurate measurement and modeling oof three-terminal chip devices such as bipolar junction and field-effect transistors has been addressed by others with varying degrees of success. This paper discusses a two-tier approach for determining highly accurate wide-band scattering parameters of chip GaAs MESFETs that are referenced at the bonding pads of the device. In a two-tier approach the first level of characterization determines error corrections for a measurement system. The second level is characterization of any test fixture used in the measurement of the device. The discussion is directed at the second level of characterization in which methods of one-port untermination and deembedding are extended to two-port measurements and a technique known as cold chip parasitic error correction is introduced which makes possible acurate placement of the S-parameter reference planes at the terminals on the chip device. Microwave modeling of the GaAs MESFET can be approached for two different directions, that of device physics and that of device measurements. This paper examines two different measurements-based modeling methods in which accurate chip level S-parameter data is a necessity. GRA

N85-28228# Rensselaer Polytechnic Inst., Troy, N. Y. Center for Integrated Electronics.
THIN FILMS PROPERTIES OF SPUTTERED NIOBIUM SILICIDE ON SiO2, Si3N4 AND ON n+ POLY-Si
T. P. Chow, W. J. Lu, A. J. Steckl, and B. J. Baliga Mar. 1985 18 p
(Contract N00014-81-K-0605)
(AD-A152378; AD-E900434; TR-11) Avail: NTIS HC A02/MF A01 CSCL 09/1

The thin film properties of sputtered niobium silicide on SiO2, Si3N4 and n(+) doped poly-Si have been investigated. The structural and compositional properties were studied with X-ray diffraction, Rutherford backscattering spectrometry and secondary ion mass spectroscopy. Niobium silicide thin films are deposited on SiO2, Si3N4 and n(+)poly-Si have been characterized. Similar to the other refractory silicides, annealing at high temperatures resulted in structural recrystallization and a sharp decrease in resistivity. After annealing at 1000 C, a resistivity of approx. 70 microohms-cm was obtained. For a 2500A NbSi2/2500A N(+)poly-Si stack, a sheet resistance of 2.5 ohms/square after annealing at the same temperature. GRA

N85-28229# Texas Technological Univ., Lubbock. Dept. of Electrical Engineering.
ENERGY CONSIDERATIONS IN SECOND BREAKDOWN Final Report, Sep. 1982 - Oct. 1984
S. A. McMullen and W. M. Portnoy Kirtland AFB, N. Mex. AF Weapons Lab. Feb. 1985 90 p
(Contract F29601-83-K-0014)
(AD-A152389; AFWL-TR-84-111) Avail: NTIS HC A05/MF A01 CSCL 20/12

The energy between the beginning of turn-off and the onset of second breakdown, dissipated at the collectors of power transistors switching inductive loads, was determined and plotted vs the time to second breakdown. A linear relationship was obtained, excluding a thermal initiation mechanism, which requires at t to the 0.5 power dependence. GRA

N85-28230# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
RESEARCH ON DESIGN OF CRYOTRANSFORMERS AND ITS PROSPECTS FOR THE FUTURE
W. Lech 28 Feb. 1985 27 p Transl. into ENGLISH from Prace Inst. Elektrotechniki (Poland), v. 23, no. 90, 1975 p 41-55
(AD-A152400; FTD-ID(RS)T-1548-84) Avail: NTIS HC A03/MF A01 CSCL 09/1

Calculation results of the technical-economic parameters of large power cryotransformers with windings of pure aluminum, presented in this paper, indicate that the production of such cryotransformers could be justified and that resumption of the research work in this field would be advisable. On the basis of significant progress in the development of new multifilament superconducting wires it was concluded that the construction of cryotransformers with superconducting windings will become feasible in the near future, and that most likely these windings will operate at the temperature of liquid hydrogen. Author (GRA)

N85-28231# Lincoln Lab., Mass. Inst. of Tech., Lexington.
THE DESIGN OF AN ADAPTIVE PREDICTIVE CODER USING A SINGLE-CHIP DIGITAL SIGNAL PROCESSOR
M. A. Randolph 11 Jan. 1985 71 p
(Contract F19628-85-C-0002)
(AD-A152461; TR-679; ESD-TR-84-276) Avail: NTIS HC A04/MF A01 CSCL 09/4

A speech coding processor architecture design study has been performed in which Texas Instruments TMS32010 has been selected from among three commercially available digital signal processing integrated circuits and evaluated in an implementation study of real-time Adaptive Predictive Coding (APC). The TMS32010 has been compared with AR&T Bell Laboratories DSP I and Nippon Electric Co. PD7720 and was found to be most suitable for a single chip implementation of APC. A preliminary design system based on TMS32010 has been performed, and several of the hardware and software design issues are discussed. Particular attention was paid to the design of an external memory controller which permits rapid sequential access of external RAM. As a result, it has been determined that a compact hardware implementation of the APC algorithm is feasible based of the TSM32010. Originator-supplied keywords include: vocoders, speech compression, adaptive predictive coding, digital signal processing microcomputers, speech processor architectures, and special purpose processor. GRA

N85-28232# Naval Underwater Systems Center, New London, Conn.
ON THE PROBABILITY DENSITY OF SIGNAL-TO-NOISE RATIO IN AN IMPROVED DETECTOR
I. P. Kirsteins 20 Feb. 1985 84 p
(AD-A152529; NUSC-TR-7331) Avail: NTIS HC A05/MF A01 CSCL 09/4

We derive an approximate probability distribution for the SNR (signal-to-noise ratio) of an improved adaptive detector in near rank-1 Gaussian noise where the filter weights are computed using the principal eigenvectors of the estimated noise covariance matrix. The noise consists of two components, a strong rank-1-covariance interference component plus white noise. Computer simulation is used to verify the approximating SNR distribution and show that it is accurate even for small sample size and low interference-to-noise ratios (INR). We use this distribution to show the improvement possible when using filter weights based on just the principal eigenvectors rather than the full inverse of the estimated sample covariance matrix when the noise covariance is near rank 1. For example we compare the expected value of SNR for our improved method and the conventional adaptive detector based on the

inverse of the estimated covariance matrix. We find that for 20 through 50 samples and an INR value of 10 dB, the expected value of SNR for our new method is better than the comparison method. Other statistics can also be obtained from the probability density. (Author). GRA

N85-28233# Harvard Univ., Cambridge, Mass. Center for Research in Computer Technology.
EFFICIENT VLSI (VERY LARGE SCALE INTEGRATION) FAULT SIMULATION
J. H. Reif Mar. 1985 47 p
(Contract N00014-80-C-0647)
(AD-A152661; TR-03-85) Avail: NTIS HC A03/MF A01 CSCL 09/5

Let C be an acyclic Boolean circuit with n gates and equal to or less than n inputs. A circuit manufacture error may result in a Stuck-at (S-A) fault is a circuit identical to C except a gate v only outputs a fixed Boolean value. The (S-A) fault simulation problem for C is to determine all possible S-A faults which can be detected (i.e., faults for which a faulty circuit and C would give distinct outputs) by a given test pattern input. We consider the case where C is a tree (i.e., has fan-out 1). We give practical algorithm for fault simulation which simultaneously determines all detectable S-A faults for every gate in the circuit tree C. Our algorithm requires only the evaluation of a circuit FS(C) which has equal to or less than 3(d+1), when d is the depth of C. Thus the sequential time of our algorithm is equal to or less than 7n, and the parallel time is equal to or less than 3(d+1). Furthermore FS(C) requires only a small constant factor more VLSI area than does the original circuit C. We also extend our results to get efficient methods for fault simulation of oblivious VLSI circuits with feedback lines. GRA

N85-28234# Naval Postgraduate School, Monterey, Calif.
MEASURED NOISE PERFORMANCE OF A NEW METHOD OF FREQUENCY HOPPING M.S. Thesis
P. S. Buczynski Dec. 1984 63 p
(AD-A152679) Avail: NTIS HC A04/MF A01 CSCL 09/4

A frequency hopping (FH) technique in which symbols are transmitted as unique multiple hop sequences is the basis of this thesis. The receiver, of primary interest, uses a phrase locked loop as a frequency to voltage converter and then uses difference amplifier circuits to compare the received sequence with all utilized sequences for data recovery. This report represents the design and results of this FH technique. A bit probability of error of 0.001 at 1.6 dB SNR was obtained. Author (GRA)

N85-28235# Lincoln Lab., Mass. Inst. of Tech., Lexington.
RESEARCH ON SUPERCONDUCTIVE SIGNAL-PROCESSING DEVICES Annual Report, 1 Oct. 1983 - 20 Sep. 1984
R. W. Ralston 30 Nov. 1984 85 p
(Contract F19628-85-C-0002)
(AD-A152703; ESD-TR-84-293) Avail: NTIS HC A05/MF A01 CSCL 09/5

A new technology utilizing superconductive components to realize convolvers and correlators that are capable of processing analog signals having bandwidths from 2-20 GHz is being developed. The technology has two key features: (1) low-loss and low-dispersion electromagnetic striplines provide tapped delay on compact substrates; and (2) superconductive tunnel junctions provide efficient low-noise mixing and high-speed sampling circuits. A convolver with a time-bandwidth product of 28 has been demonstrated. Projections indicate that superconductive technology should support analog devices with time-bandwidth products of 1000 or greater. GRA

N85-28236# Department of the Army, Washington, D. C.
ACCELERATION INSENSITIVE OSCILLATOR Patent Application
F. L. Walls and J. R. Vig, inventors (to Army) Filed 25 Mar. 1985 17 p
(AD-D011621; US-Patent-Appl-SN-715862) Avail: NTIS HC A02/MF A01 CSCL 09/1

This invention related generally to improvements in the acceleration sensitivity of quartz crystal oscillators and more particularly to the elimination of acceleration-induced frequency shifts in such oscillators. A crystal oscillator, including two crystals of unequal acceleration sensitivity magnitude and mounted such that their respective acceleration sensitivity vectors are aligned in an antiparallel relationship, further includes at least one electrical reactance, such as a variable capacitor, coupled to one of the crystals for providing cancellation of acceleration sensitivities. After the acceleration sensitivity vectors of the two crystals are aligned antiparallel. The variable capacitor is adjusted until the net or resultant acceleration sensitivity vector of the pair of resonators is reduced to zero. A second electrical reactance, such as a variable capacitor, is utilized as a tuning capacitor for adjusting the oscillator's output frequency to the desired level, while maintaining the cancellation of acceleration sensitivities. GRA

N85-28237# Texas Technological Univ., Lubbock. Laser Lab.
SPARK GAP ELECTRODE EROSION Final Report, 1 Oct. 1983 - 30 Sep. 1984
H. Krompholz and M. Kristiansen 20 Dec. 1984 137 p
(Grant AF-AFOSR-0015-84)
(AD-A152802; AFOSR-85-0282TR) Avail: NTIS HC A07/MF A01 CSCL 09/1

The results of a one-year contract on electrode erosion phenomena are summarized. The arc voltage drop in a spark gap was measured for various electrode, gas, and pressure combinations. A previously developed model of self breakdown voltage distribution was extended. A jet model for electrode erosion was proposed and an experimental arrangement for testing the model was constructed. The effects of inhomogeneities and impurities in the electrodes were investigated. Some of the work described here is scheduled for completion in 1985 under a current grant (AFOSR 84-0032). The areas of investigation described here include: (1) Self breakdown voltage distributions; (2) Electrode erosion; (3) Spark gap voltage recovery. GRA

N85-28238# Arizona Univ., Tucson.
TECHNIQUES FOR OPERATING CHARGE COUPLED DEVICES (CCD'S) IN VERY HIGH SPEED FRAMING MODE Interim Report
Richard S. Aikens (Photometrics Ltd., Tucson, Ariz.), Patrick M. Epperson, and M. Bonner Denton 19 Mar. 1985 20 p Submitted for publication
(Contract N00014-83-K-0268; ONR Proj. 051-549)
(AD-A152878; TR-37) Avail: NTIS HC A02/MF A01 CSCL 17/2

New concepts for operating charge coupled devices (CCD's) in a multiple frame transfer mode which allow very high speed imaging of transient phenomena are described. These methods coupled with the inherent advantages of slow scan readout, including high dynamic range, low noise and excellent linearity, provide unique, new observational capabilities. Appropriate masking techniques allow a large portion of the CCD to be employed as a high speed image buffer. Applications include spatial imaging of rapidly moving objects, observations of transient spectral chemical phenomena and the study of rapid physiological motion. GRA

N85-28239# Naval Postgraduate School, Monterey, Calif.
EXPERIMENTAL PERFORMANCE OF A FREQUENCY MEASUREMENT CIRCUIT M.S. Thesis
G. H. Eastwood Dec. 1984 88 p
(AD-A152951) Avail: NTIS HC A05/MF A01 CSCL 14/2

The accuracy with which the frequency of a sinusoid and a pulsed sinusoid can be measured using a phase locked loop is investigated. A frequency divider is inserted into the feedback loop and a very stable local clock is used to determine the effect of these modifications on the frequency measurement accuracy of the phase locked loop. The primary result is that there is no theoretical limit to the accuracy of frequency measurement, independent of gate time, using a phase locked loop with frequency division and very stable clocks. The practical tradeoffs for improved frequency measurement accuracy are a higher required signal to

noise ratio and a reduction of the frequency capture range of the phase locked loop. GRA

N85-28240# Polytechnic Inst. of New York, Farmingdale. Dept. of Chemistry.
INVESTIGATION OF THE STRUCTURE AND DYNAMICS OF ELECTROLYTES IN SOLVENTS USED FOR PRIMARY AND SECONDARY LI-BATTERIES Final Report, 1 Mar. 1982 - 28 Feb. 1985
S. Petrucci Feb. 1985 13 p
(Contract DAAG29-82-K-0048)
(AD-A153099; ARO-18978.8-CH) Avail: NTIS HC A02/MF A01 CSCL 10/3

During the past three years, we have investigated the structure and dynamics of lithium electrolytes in solvents of low permittivity as ethers and dimethyl carbonate. These systems are highly relevant for the construction of batteries using lithium anodes. It appeared necessary to offer the electrolyte species present in the electrolyte solutions and the lifetime and structure of these species. This information is essential for an optimum choice of the electrolyte solution to be used for battery planning and construction. To the above end we have used Raman spectra (occasionally), electrical conductance, microwave dielectric relaxation and radio frequency ultrasonic relaxation. Many systems show a significant amount of quadrupoles or dimers present in the solution. Theoretical expression for the formation constant K sub q of dimers and enthalpy, entropy, isothermal and adiabatic volume changes have been calculated from statistical thermodynamic augments. In particular, a Bjerrum-type theory for associated of electrolytes (AB) to dimers (AB)2 has been developed. GRA

N85-28241# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
EFFECTS OF THE CORONA WIND ON THE COOLING OF A HORIZONTAL CYLINDER M.S. Thesis
L. E. Hogue Dec. 1984 100 p
(AD-A153101; AFIT/GA/AA/84D-4) Avail: NTIS HC A05/MF A01 CSCL 13/1

This thesis describes experiments conducted to determine the effect of the corona wind in the convective heat transfer from a horizontally mounted, heated aluminum cylinder. The cylinder was maintained at ground potential with respect to a positive high voltage emitter. Three types of emitter were used in the testing to create the corona wind: two stretched wires, 0.004 in and 0.0125 in diameter and a 19 point emitter. Tests in the free convection conditions and with the emitters at various distances and field voltages up to 15kV were performed to establish a baseline. Emitters with and without a metallic mesh grid and a two dimensional wooden shroud were tested in various configurations over a range of electrostatic field conditions. In addition, the velocity of the corona wind in certain configurations were measured and a blown air system were used to simulate the corona wind with uncharged air to compare their respective effects on the convective heat transfer from the cylinder. GRA

N85-28242# Southeastern Center for Electrical Engineering Education, Inc., St. Cloud, Fla.
BASIC EMC TECHNOLOGY ADVANCEMENT FOR C3 SYSTEMS. VOLUME 4F: PREDICTION OF CROSSTALK IN FLATPACK COAXIAL CABLES Final Technical Report, Sep. 1982 - Dec. 1983
W. E. Beech and C. R. Paul Dec. 1984 110 p
(Contract F30602-81-C-0062)
(AD-A153111; RADC-TR-82-286-Vol-4F) Avail: NTIS HC A06/MF A01 CSCL 09/3

The electromagnetic crosstalk present in a class of cables known as flatpack, coaxial cables is investigated. The multiconductor transmission line equations are used to derive a model of a general flatpack, coaxial cable consisting of n cables. This model is then implemented as a digital computer program to allow simulation of the crosstalk levels present in the cable. This simulation is compared to experimental results to prove that the model is valid and can accurately predict the crosstalk levels. Also, the effect of common impedance coupling, the presence of drain wires to allow for connection to the shields of the cable, and the presence of pigtail sections (exposed sections of wire) is examined to determine their effect on the overall electromagnetic crosstalk present in the cable. GRA

N85-28243# Westinghouse Defense and Electronic Systems Center, Baltimore, Md. Advanced Technology Div.
ANALYSIS OF TIME DEPENDENT DIELECTRIC FAILURES Final Report, Aug. 1982 - Aug. 1984
J. S. Kim, P. G. McMullin, and J. W. Dzimianski Griffiss AFB, N.Y. RADC Feb. 1985 85 p
(AF Proj. 2338)
(AD-A153200; RADC-TR-85-16) Avail: NTIS HC A05/MF A01 CSCL 20/3

The Time Dependent Dielectric Breakdown (TDDB) has been studied for silicon dioxide by using a staircase voltage ramping technique. The result of the ramp tests on MOS capacitors indicates a definitive substrate effect on the TDDB, which manifests itself as an enhancement of the intermediate field breakdown in the breakdown histogram. The substrate effect observed may be caused by the oxygen impurities of the starting material. This conclusion is based on the observed fact that the gate oxide grown on the high oxygen content Czochralski wafers (35 ppm) shows the breakdown enhancement, while the gate oxide grown on the low oxygen content (<1ppm) float-zone wafers does not. GRA

N85-28244# Illinois Univ., Urbana. Urbana Dept. of Electrical Engineering.
THE CONSTRUCTION AND STUDY OF IMPROVED Al(X)Ga(1-X) As-GaAs HETEROSTRUCTURE DEVICES Final Report, 15 Feb. 1982 - 31 Mar. 1985
N. Holonyak, Jr., G. E. Stillman, K. Hess, and J. J. Coleman Mar. 1985 65 p
(Contract DAAG29-82-K-0059)
(AD-A153264; ARO-18509.51-EL) Avail: NTIS HC A04/MF A01 CSCL 09/1

The III-V materials GaAs, Al sub x Ga subl-x As, AlAs offers important advantages that make possible the fabrication of a large range of sophisticated heterostructure devices. The devices that have concerned us most are: quantum-well heterostructure lasers, heterostructure phototransistors, real-space transfer devices, and high electron mobility transistors. This report describes extensive studies of the optical and electrical properties of these devices as well as the physical properties of semiconductor heterolayer structures. Emphasis was placed on superlattice disordering and pattern generation by silicon diffusion; stripe-geometry and buried-heterostructure lasers have been realized by this method (i.e., impurity-induced disordering). Tunable laser operation in external gratings as well as under hydrostatic pressure has been accomplished with quantum-well heterostructures. This has resulted, for the first time, in tunable semiconductor laser operation over a 100 meV range. The theory of the dielectric constant of superlattices has also been considerably refined. Two manuscripts have been devoted to the two-dimensional modeling of the high mobility transistor and one manuscript discusses the interface quality of our MOCVD-grown superlattices. GRA

N85-28245# IIT Research Inst., Chicago, Ill.
VLSI (VERY LARGE SCALE INTEGRATED CIRCUITS) DEVICE RELIABILITY MODELS Final Report, Oct. 1981 - May 1984
D. Coit, W. Denson, K. Key, S. Flint, and W. Turkowski Dec. 1984 232 p
(Contract F30602-81-C-0242)
(AD-A153268; RADC-TR-84-182) Avail: NTIS HC A11/MF A01 CSCL 09/5

This report details a study in which the objective was to develop failure rate prediction models for VLSI, Hybrid, analog microprocessor, and VHSIC devices. A description is given of the various phases involved in reliability prediction model development, such as; literature collection/review, investigation of failure modes, failure rate data collection, statistical analysis methodologies, model

factors quantification, and model validation. For VLSI, Hybrid and analog microprocessor devices, the models are given in a form which can easily be included in MIL-HDBK-217. For VHSIC devices, this effort was necessarily limited to the identification of necessary model factors (attributes) which should be included in a quantitative model acceptable for inclusion in MIL-HDBK-217. This effort was necessarily limited to the development of a qualitative reliability prediction model due to the lack of available data on VHSIC devices at the time of this study. GRA

N85-28246# Electronic Systems Div., Hanscom AFB, Mass.
DERATED APPLICATION OF PARTS FOR (ELECTRONIC SYSTEMS DIVISION) SYSTEMS DEVELOPMENT. REVISION
Mar. 1985 58 p Original language document previously announced as N84-14429
(AD-A153299; ESD-TR-85-148) Avail: NTIS HC A04/MF A01 CSCL 15/5

This document establishes part derating to be implemented on AFSC/ESD contracts. These criteria were prepared for ESD by RADC/RB and reflect the design derating criteria prepared for them under contract F30602-81-V-0073, as well as other RADC data. Established derating values for the majority of parts in MIL-HDBK-217, and a suggested approach for verification of derating parameters are included. Recommendations for improving, clarifying or tailoring these iterim derating criteria should be addressed to: Electronic Systems Division, Attn: ALE, Hanscom Air Force Base, Bedford, Massachusetts 01731. Please provide an info copy to RADC/RBER, Griffiss Air Force Base, New York 13441. GRA

N85-28247# McElroy (Ralph) Co., Austin, Tex.
PROCESS FOR MAKING ELECTRODES FOR DISCHARGE TUBES
Inoue Kyoshi Mar. 1985 7 p Transl. into ENGLISH of Japanese Patent no. Sho 49(1974)-16465 (22 Apr. 1974)
(Contract W-7405-eng-48)
(DE85-008898; UCRL-Trans-12051) Avail: NTIS HC A02/MF A01

A process for making electrodeswhich greatly improve the function and life of discharge tubes, mainly cold cathode discharge tubes, and the electrodes in a prescribed form are made from powdery electrode materials by electrospark sintering is discussed. DOE

N85-28248# Case Western Reserve Univ., Cleveland, Ohio. Dept. of Chemistry.
BIFUNCTIONAL OXYGEN ELECTRODES Final Report
D. Tryk, W. Aldred, Z. Chen, C. Fierro, J. Hashiguchi, M. Hossain, Z. Zhang, and F. Zhao Jan. 1985 150 p refs Prepared for California Univ., Lawrence Berkeley Lab.
(Contract DE-AC03-76SF-00098)
(DE85-006871; LBL-19003) Avail: NTIS HC A07/MF A01

The objective of the research on bifunctional oxygen electrodes for alkaline electrolytes was to improve significantly both the cathodic and anodic polarization as well as the cycle life of such electrodes. The research has focused on finding high-efficiency, long-life electrocatalysts for O2 reduction and generation and achieving an understanding of the mechanisms of the catalysis. Catalyst systems which have been examined in alkaline electrolytes have included the following:various types of carbons and graphites; chemically-modified carbons and graphites using adsorptive attachment (e.g., various quinones, macrocycles and chemical linkages); silver and various intermetallics; various oxide systems including perovskites, spinels, pyrochlores and other mixed transition metal oxides; transition metal macrocycles including porphyrins, phthalocyanines, naphthalocyanines and tetraazaannulenes; and thermally-treated macrocycles. Mechanistic studies have particularly focused on the reduction of O2 on various carbon/graphite surfaces and the role of the O2(-) radical ion. DOE

N85-28249# Public Service Electric and Gas Co., Newark, N. J.
BASELINE CYCLE TESTING OF A 500-kWh ZINC CHLORIDE BATTERY AT THE BATTERY ENERGY STORAGE TEST (BEST) FACILITY Interim Report
E. Hyman Jan. 1985 65 p refs Sponsored by Electric Power Research Inst.
(Contract DE-AC02-76ET-29368; EPRI Proj. 255-2)
(DE85-006948; EPRI-EM-3836) Avail: NTIS HC A04/MF A01; Research Reports Center, Box 50490, Palo Alto, CA 94303, HC $10.00

Performance tests of an advanced zinc chloride battery storage system under utility control at a 13-kv substation - provided baseline information on operating characteristics and developmental needs. Commercial testing of a 2-Mw demonstration battery system is planned for 1985 and 1986. DOE

N85-28250# McElroy (Ralph) Co., Austin, Tex.
ELECTRODES FOR FLASH DISCHARGE LAMPS
Mar. 1985 7 p Transl. into ENGLISH from Japanese Patent SHO50[1975]-14069 (Appl. No. Sho45[1970]-39019, 24 May 1975) Prepared for California Univ., Livermore. Lawrence Livermore Lab.
(DE85-008897; UCRL-Trans-12050) Avail: NTIS HC A02/MF A01

An electrode for a flash discharge lamp was invented. The electrode is made from a sintered body composed of 95 to 70 wt % of metal powder and 5 to 30 wt % of beryllium oxide salt with an alkaline earth metal. The electrode for discharge lamp is strongly resistant to ion bombardment, and does not blacken the sealing tubes. DOE

N85-28251# California Univ., Livermore. Lawrence Livermore Lab.
TRANSPORT IN AQUEOUS BATTERY SYSTEMS
Donald G. Miller and Joseph A. Rard 27 Dec. 1984 10 p refs
(Contract W-7405-eng-48)
(DE85-007246; UCID-20303) Avail: NTIS HC A02/MF A01

Mutual diffusion coefficients were measured for twelve concentrations of aqueous high purity stoichiometric ZnOl2 at 25.00 + or - 0.005(0)C using Rayleigh interferometry. These measurements are precise to 0.1 to 0.2% and cover the concentration intervals of 0.004996 to 0.049984 and 4.4985 to 7.2489 mol-(kg H2O) (-1). A table summarizes all of these ZnCl2 high purity diffusion coefficients measured over the last several years. DOE

N85-28252# McElroy (Ralph) Co., Austin, Tex.
ELECTRODE FOR FLASH DISCHARGE LAMPS
Oyama Masamitsu and Tanaka Toshio Mar. 1985 7 p Transl. into ENGLISH of Japanese Patent Sho 49(1974)-16994 (26 Apr. 1974) Prepared for Lawrence Livermore National Lab., Calif.
(Contract W-7405-eng-48)
(DE85-008896; UCRL-Trans-12049) Avail: NTIS HC A02/MF A01

The invention relates to an electrode for flash discharge lamps. The electrode is made from a substrate metal containing vanadium and an electron-emitting material from barium aluminate, thorium oxide, or a mixture therefore by shaping into a rod form and sintering. The electrodes are installed 25 mm apart inside a Pyrex glass tube and xenon gas is filled into the tube until the pressure reaches 400 mmHg and sealed. This improves the luminous efficacy. DOE

N85-28253# Tennessee Valley Authority, Chattanooga.
TEST AND EVALUATION OF THE HOPPECKE MODEL E240G-144/16 ELECTRIC VEHICLE BATTERY CHARGER
R. L. Driggans, R. W. Reese, and A. S. Keller Nov. 1984 53 p Sponsored by EPRI
(DE85-900573; TVA/PE/EDT-85/5) Avail: NTIS HC A04/MF A01

The Hoppecke Model E240 G 144/16 electric vehicle battery charger was tested. Charger input/output voltage, current, and power characteristics and input waveform distortion were measured and induced electromagnetic interference was evaluated as the charger recharged a lead acid battery pack. Electrical quantities were measured with precision volt-ampere-watt meters, frequency

counters, a digital storage oscilloscope, and a spectrum analyzer. The Hoppecke charger required 12.2 hours to recharge a 144V battery from 100% depth of discharge (DOD). Energy efficiency was 82%, specific power was 81.2W/Kg (36.8W/lb), input current distortion varied from 52.6 to 73.6%, and electromagnetic interference was observed on AM radio. Charge factor was 1.25 from 100% DOD, increasing to 1.52 from 25% DOD. DOE

N85-28254# Sandia Labs., Albuquerque, N. Mex.
EFFECTS OF PROCESSING CHEMISTRY ON ELECTRICAL PROPERTIES OF HIGH FIELD ZnO VARISTORS
R. G. Dosch 1985 14 p refs Presented at 2nd Intern. conf. on Ultrastructure Processing of Ceram., Glasses and Composites, Daytona Beach, Fla., 25 Feb. 1985
(Contract DE-AC04-76DP-00789)
(DE85-007688; SAND-85-0387C; CONF-850267-1) Avail: NTIS HC A02/MF A01

High-field ZnO-based varistors (10 less than or equal to E less than or equal to 100 kV/cm at J = 5A/cm(2)) with nonlinearity coefficients ((ALPHA)) greater than 30 were fabricated by sintering chemically prepared precursor powders at 675 to 740(0)C in air. The chemistry used is discussed and related to precursor powder morphology and to microstructural and electrical properties of varistors. The zinc salts used as the starting material and the aging time of the hydroxide coprecipitate prior to conversion to the oxalate form are also discussed. DOE

N85-28255# Edgerton, Germeshausen and Grier, Inc., San Ramon, Calif.
STREAK TUBE CHARACTERIZATION
C. K. Hinrichs Apr. 1985 41 p
(Contract DE-AC08-83NV-10282)
(DE85-009874; EGG/10282-4035) Avail: NTIS HC A03/MF A01

An explanation is given of some of the phenomena that occur in electrostatically focused streak tubes and how they can affect various measurements. These phenomena have to do with the overall tube voltage (cathode to anode/screen), cathode resistivity, space charge effects, chromatic effects (those caused by the spread in energy distribution of photoelectrons), off axis focus, deflection defocusing, and the phosphor screen. Some important static and dynamic streak tube measurements are then described. The static measurements include those of photocathode spectral sensitivity and uniformity, phosphor screen measurements, tube radiant gain, extinction ratio, static resolution, magnification, and distortion. The dynamic measurements include spatial and time resolution. DOE

N85-28256# Sandia Labs., Albuquerque, N. Mex. Electrical Standards Div.
TECHNIQUE FOR MEASURING THE EFFECTIVE SOURCE REFLECTION COEFFICIENT OF 2-RESISTOR POWER SPLITTERS
Robert D. Moyer Mar. 1985 13 p refs
(Contract DE-AC04-76DP-00789)
(DE85-009964; SAND-84-2420) Avail: NTIS HC A02/MF A01

Three different methods for measuring the effetive source reflection coefficient of two-resistor power splitters are described. It is argued and data show that the Active Open-Circuit method produces measured values with smaller uncertainty than the other two. DOE

N85-28257# Stuttgart Univ. (West Germany). Inst. fuer Netzwerk- und Systemtheorie.
SC FILTERS AND DESIGN CENTERING OF INTEGRATED CIRCUITS. PART 2: DESIGN CENTERING OF INTEGRATED CIRCUITS Final Report, Dec. 1983
Ernst Lueder, Hans Kreutzer, and Michael Opelt Bonn Bundesministerium fuer Forschung und Technologie Dec. 1984 41 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-84-265-Pt-2; ISSN-0340-7608) Avail: NTIS HC A03/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 8.50

A statistical program for design centering for cheap production of integrated circuits was developed. Design centering provides mathematical means to shift the parameters of a circuit to a location (design center), where they can fluctuate in a wider range without impairing the function of the circuit. The method can be used to enhance the performance of an integrated circuit. With a modification of the program the design center can also be found starting with circuit parameters which do not meet the tolerance specifications. The program is successfully applied to the design of VLSI circuits. Author (ESA)

N85-28258# Hahn-Meitner-Institut fuer Kernforschung, Berlin (West Germany). Bereich Datenverarbeitung und Elektronik.
THE GfW HANDBOOK FOR DATA COMPILATION OF IRRADIATION TESTED ELECTRONIC COMPONENTS, VOLUME 3
F. Wulf, D. Braeunig, and A. Boden May 1984 665 p Sponsored by DFVLR
(HMI-B-353-Vol-3; NT-53/08-Vol-3) Avail: NTIS HC A99/MF A01

Fifty-three standardized reports of spacecraft electronic components irradiation tests are presented. Statistical values are given which enable reader to evaluate the components life time in a radiative environment. Author (ESA)

N85-28151# Joint Publications Research Service, Arlington, Va.
SELF-SCANNING MDS-INTEGRATED PHOTOSENSOR STRIP
Yu. Kh. Kagan, E. L. Kashcheyev, S. V. Kruglikov, M. A. Mayorchuk, Yu. A. Manukhin, and S. I. Naymark *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-85-004) 15 May 1985 p 37-47 refs Transl. into ENGLISH from Avtometriya (Novosibirsk), v. 3, May - Jun. 1984 p 50-56 (For primary document see N85-28142 17-31)
Avail: NTIS HC A06/MF A01

N85-28179# Joint Publications Research Service, Arlington, Va.
GOALS, ACHIEVEMENTS OF MICROELECTRONICS PROGRAM
Laszlo Schronk *In its* East Europe Rept.: Sci. and Technol. (JPRS-ESA-85-017) 2 May 1985 p 28-35 Transl. into ENGLISH from Meres es Autom. (Budapest), no. 11, 1984 p 426-429 (For primary document see N85-28177 17-31)
Avail: NTIS HC A05/MF A01

N85-28180# Joint Publications Research Service, Arlington, Va.
USES OF, EXPERIENCES IN PRODUCTION OF CUSTOM DESIGNED IC'S
Ferenc Heksch *In its* East Europe Rept.: Sci. and Technol. (JPRS-ESA-85-017) 2 May 1985 p 41-48 Transl. into ENGLISH from Meres es Autom. (Budapest), no. 11, 1984 p 399-405 (For primary document see N85-28177 17-31)
Avail: NTIS HC A05/MF A01

N85-28181# Joint Publications Research Service, Arlington, Va.
MODERN EQUIPMENT FOR MANUFACTURE OF IC'S IN HUNGARY
Janos Erdelyi *In its* East Europe Rept.: Sci. and Technol. (JPRS-ESA-85-017) 2 May 1985 p 49-54 Transl. into ENGLISH from Meres es Autom. (Budapest), no. 11, 1984 p 412-417 (For primary document see N85-28177 17-31)
Avail: NTIS HC A05/MF A01

N85-28318# Compagnie d'Electronique et de Piezo-Electricite, Argenteuil (France).
HIGH PERFORMANCES FROM A NEW DESIGN OF CRYSTAL OSCILLATOR
G. Beuvy, G. Marotel, and P. Renoult *In* NRL Proc. of the 15th Ann. Precise Time and Time Interval (PTTI) Appl. and Planning Meeting 2 Apr. 1985 p 621-634 (For primary document see N85-28287 17-35)
Avail: NTIS HC A99/MF E03 CSCL 14/2

N85-28319# Compagnie d'Electronique et de Piezo-Electricite, Argenteuil (France).
DESIGN OF SC CUT 10 MHZ H.Q. CRYSTALS WITH G. SENSITIVITY BETTER THAN 2.10(-10)/G

A. Debaisieux, J. P. Aubry, and J. Groslambert (CNRS, Becancon, France) *In* NRL Proc. of the 15th Ann. Precise Time and Time Interval (PTTI) Appl. and Planning Meeting 2 Apr. 1985 p 635-652 refs (For primary document see N85-28287 17-35)
Avail: NTIS HC A99/MF E03 CSCL 14/2

34 FLUID MECHANICS AND HEAT TRANSFER

Includes boundary layers; hydrodynamics; fluidics; mass transfer; and ablation cooling.

For related information see also *02 Aerodynamics* and *77 Thermodynamics and Statistical Physics.*

N85-28259*# Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Mechanical Engineering.
AN EXPERIMENTAL INVESTIGATION OF A TURBULENT JUNCTION VORTEX Interim Report
M. D. Harsh and F. J. Pierce Feb. 1985 292 p refs
(Grant NsG-2301)
(NASA-CR-175915; NAS 1.26:175915; VPI-E-85-4) Avail: NTIS HC A13/MF A01 CSCL 20D

An experimental study of the incompressible, three-dimensional, turbulent flow separation around the base of a bluff obstacle on a flat surface is described. The bluff obstacle is a streamlined, right circular cylinder mounted with its axis normal to the flat surface. The flow environment is characterized by a body Reynolds number of 183,000, based on the diameter of the circular cylinder. The study includes surface flow visualizations, surface pressure measurements, and mean flow measurements. The mean flow measurements consist of total pressure, static pressure, and velocity distributions in three planes around the base of the streamlined cylinder. The results show the presence of a large, dominant vortex in the junction between the cylinder and the flat surface. This vortex was found to consist of low total pressure fluid from the boundary layer flow upstream of the junction. In addition to the three-dimensional flow measurements, extensive measurements in the two-dimensional turbulent boundary layer on the flat surface are reported. R.J.F.

N85-28260*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
FLUID SURFACE BEHAVIOR IN LOW GRAVITY. CENTER DISCRETIONARY FUND NO. 83-21 Final Report
Fred Leslie, Roger F. Gans, and Charles Schafer Jun. 1985 28 p refs
(NASA-TP-2486; NAS 1.60:2486) Avail: NTIS HC A03/MF A01 CSCL 20D

Measurements of rotating equilibrium bubble shapes in the low-gravity environment of a free-falling aircraft are presented. Emphasis is placed on bubbles which intersect the container boundaries. These data are compared with theoretical profiles derived from Laplace's formula and are in good agreement with the measurements. Two types of instability are explored. The first occurs when the baffle spacing is too large for the bubble to intersect both the top and bottom boundaries. The second occurs when the hydrostatic pressure beneath a displaced free surface does not compensate for pressure change due to capillary forces. The interface shape depends on the contact angle, the radius of intersection with container, and the parameter F which is a measure of the relative importance of centrifugal force to surface tension. For isolated bubbles, F has a maximum value of 1/2. A further increase in F causes the bubble to break contact with the axis of rotation. For large values of F, the bubble becomes more cylindrical and the capillary rise occurs over a thinner layer so that the small radius of curvature can generate enough pressure drop to balance the increased hydrostatic contribution. Author

N85-28261*# CHAM of North America, Inc., Huntsville, Ala.
ANALYSIS OF PHYSICAL-CHEMICAL PROCESSES GOVERNING SSME INTERNAL FLUID FLOWS Progress Report, May 1985
A. K. Singhal, S. F. Owens, T. Mukerjee, C. Prakash, A. J. Przekwas, and M. Kannapel Jun. 1985 42 p
(Contract NAS8-35970)
(NASA-CR-175893; NAS 1.26:175893; CHAM-4045/22) Avail: NTIS HC A03/MF A01 CSCL 20D

The basic issues concerning the physical chemical processes of the Space Shuttle Main Engine are discussed. The objectives being to supply the general purpose CFD code PHOENICS and the associated interactive graphics package - GRAFFIC; to demonstrate code usage on SSME related problems; to perform computations and analyses of problems relevant to current and future SSME's; and to participate in the development of new physical models of various processes present in SSME components. These objectives are discussed in detail. E.R.

N85-28262*# National Aeronautics and Space Administration, Washington, D. C.
HEAT TRANSFER IN PIPES
Th. Burbach Apr. 1985 47 p refs Transl. into ENGLISH from the book "Stroemungswiderstand und Waermeuebertragung in Roehren" Leipzig, 1930 p 45-88 Transl. by The Corporate Word, Inc., Pittsburgh
(Contract NASw-4006)
(NASA-TM-77838; NAS 1.15:77838) Avail: NTIS HC A03/MF A01 CSCL 20D

The heat transfer from hot water to a cold copper pipe in laminar and turbulent flow condition is determined. The mean flow through velocity in the pipe, relative test length and initial temperature in the vessel were varied extensively during tests. Measurements confirm Nusselt's theory for large test lengths in laminar range. A new equation is derived for heat transfer for large starting lengths which agrees satisfactorily with measurements for large starting lengths. Test results are compared with the new Prandtl equation for heat transfer and correlated well. Test material for 200- and to 400-diameter test length is represented at four different vessel temperatures. Author

N85-28263*# Calspan Field Services, Inc., Arnold AFS, Tenn.
ANALYSIS OF HEAT-TRANSFER MEASUREMENTS FROM 2 AEDC WIND TUNNELS ON THE SHUTTLE EXTERNAL TANK Final Report, Oct. 1982 - Nov. 1983
Kenneth W. Nutt AEDC 4 Jan. 1984 81 p refs
(NASA-CR-171470; NAS 1.26:171470; AEDC-TR-84-03) Avail: NTIS HC A05/MF A01 CSCL 20D

Previous aerodynamic heating tests have been conducted in the AEDC/VKF Supersonic Wind Tunnel (A) to aid in defining the design thermal environment for the space shuttle external tank. The quality of these data has been under discussion because of the effects of low tunnel enthalpy and slow model injection rates. Recently the AEDC/VKF Hypersonic Wind Tunnel (C) has been modified to provide a Mach 4 capability that has significantly higher tunnel enthalpy with more rapid model injection rates. Tests were conducted in Tunnel C at Mach 4 to obtain data on the external tank for comparison with Tunnel A results. Data were obtained on a 0.0175 scale model of the Space Shuttle Integrated Vehicle at Re/ft = 4 x 10 to the 6th power with the tunnel stagnation temperature varying from 740 to 1440 R. Model attitude varied from an angle of attack of -5 to 5 deg and an angle of sideslip of -3 to 3 deg. One set of data was obtained in Tunnel C at Re/ft = 6.9 x 10 to the 6th for comparison with flight data. Data comparisons between the two tunnels for numerous regions on the external tank are given. G.L.C.

N85-28264*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
KOLMOGOROV AND SCALAR SPECTRAL REGIMES IN NUMERICAL TURBULENCE
Robert M. Kerr Jun. 1985 32 p refs
(NASA-TM-86699; Rept-85160; NAS 1.15:86699) Avail: NTIS HC A03/MF A01 CSCL 20D

Velocity and passive-scalar spectra for turbulent fields generated by a forced three-dimensional simulation and Taylormicroscale

Reynolds numbers up to 83 are shown to have distinct spectral regimes, including a Kolmogorov inertial subrange. Both one- and three-dimensional spectra are shown for comparison with experiment and theory, respectively. When normalized by the Kolmogorov dissipation scales velocity spectra collapse to a single curve and a high-wavenumber bulge is seen. The bulge leads to an artificially high Kolmogorov constant, but is consistent with recent measurements of the velocity spectrum in the dissipation regime and the velocity-derivative skewness. Scalar spectra, when normalized by the Oboukov-Corrsin scales, collapse to curves which depend only on Prandtl number and show a universal inertial-convective subrange, independent of Prandtl number. When normalized by the Batchelor scales, the scalar spectra show a universal dissipation regime which is independent of Prandtl numbers from 0.1 to 1.0. The time development of velocity spectra is illustrated by energy-transfer spectra in which distinct pulses propagate to high wavenumbers. B.W.

N85-28265# Ballistic Research Labs., Aberdeen Proving Ground, Md.

NAVIER-STOKES COMPUTATIONAL STUDY OF AXISYMMETRIC TRANSONIC TURBULENT FLOWS WITH A TWO-EQUATION MODEL OF TURBULENCE

J. Sahu Feb. 1985 103 p
(DA Proj. 1L1-61102-AH-43)
(AD-A152653; AD-F300599; BRL-TR-2643) Avail: NTIS HC A06/MF A01 CSCL 20/4

A thin-layer Navier-Stokes code has been used to compute the turbulent flow over two axisymmetric bodies at transonic speeds and the results are compared to experiment. A critical element of calculating such flows is the turbulence model. Numerical computations have been made with an algebraic eddy viscosity model and the k-epsilon two-equation model. The k-epsilon equations are developed in a general spatial coordinate system and incorporated into the thin-layer, compressible, time dependent Navier-Stokes code. The same implicit algorithm that simultaneously solves the Reynolds-averaged mean flow equations is extended to solve the turbulence field equations using block tridiagonal matrix inversions. Calculations with the k-epsilon model are extended up to the wall and exact values of k and epsilon at the wall are used as boundary conditions. GRA

N85-28266# Air Force Wright Aeronautical Labs., Wright-Patterson AFB, Ohio.

PROCEEDINGS OF THE 9TH US AIR FORCE AND THE FEDERAL REPUBLIC OF GERMANY DATA EXCHANGE AGREEMENT MEETING, VISCOUS AND INTERACTING FLOW FIELD EFFECTS

A. W. Fiore Aug. 1984 313 p Meeting held at Silver Spring, Md., 9-10 May 1984
(AD-A153020) Avail: NTIS HC A14/MF A01 CSCL 20/4

The 9th U.S. Air Force/Federal Republic of Germany Data Exchange Agreement Meeting entitled Viscous and Interacting Flow Field Effects was sponsored by the Air Force Flight Dynamics Laboratory. It was held on the 9th and 10th of May, 1984 at the Naval Surface Weapons Center in Silver Spring Maryland. This report contains the detailed proceedings of that meeting. It contains both theoretical and experimental results concerning a great variety of topics in the area of boundary layer research. The speed range extends from subsonic to hypersonic Mach numbers. The types of boundary layers reported include laminar, transitional, and turbulent in the presence of attached and/or separated conditions. B.W.

N85-28267# Hokenson (Gustave J.), Los Angeles, Calif.

COHERENT STRUCTURE REFLECTIVE TURBULENT VISCOUS FLOW MODELING Final Report, 15 Jan. 1984 - 15 Jan. 1985

G. J. Hokenson 15 Dec. 1984 41 p
(Contract F49620-84-C-0014)
(AD-A153086; HOKE-84-AF-01; AFOSR-85-0198TR) Avail: NTIS HC A03/MF A01 CSCL 20/4

Utilizing a multiple-element scale/coherence decomposition of the Navier-Stokes equations, the essential characteristics of the large scale turbulent structure are computed in wall-bounded shear flows. The effect of small-scale turbulence structure is modeled and the large-scaled turbulence structure is computed assuming weakly non-linear large-scale dynamics. The effects of large-scale non-linearity and the presence of wave-like elements in the flow are accounted for utilizing perturbation theory. The resultant propagation, evolution (in the convected reference frame) and (statistical) occurrence of three-dimensional vertical instabilities are computed and compared to experimental data. Subsequently, coherent reflective turbulence models shall be constructed from this analysis. GRA

N85-28268# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.

CHARACTERISTICS OF A CONFINED JET THRUST VECTOR CONTROL NOZZLE M.S. Thesis

A. J. Porzio Dec. 1984 69 p
(AD-A153087; AFIT/GAE/AA/84D-22) Avail: NTIS HC A04/MF A01 CSCL 20/4

A study of confined jet thrust vector control (CJTVC) is presented. By isolating an area of flow separation within the body of a nozzle, CJTVC has the advantage over other thrust vector controls using secondary injection (SI) in that it can operate independent of altitude. This makes it ideal for applications in small missiles and spacecraft attitude control. In this study, axial thrust, side force, and pressure distribution across the nozzle were measured. The parameters were SI pressure, primary short supply pressure, and SI port area. Results indicate that there is a lower limit to the supply pressure ratio (SI pressure to primary pressure) and SI mass flow below which, the nozzle will not produce side force. Also, above a primary pressure of 200 psig, the undeflected jet exhibits instabilities. Without SI, a 4 Hz oscillation occurs in the nozzle and switching jet attachment occurs near the throat. GRA

N85-28269# Lehigh Univ., Bethlehem, Pa.

VORTICES IN NON-NEWTONIAN FLUIDS Final Report, 14 Dec. 1981 - 13 Dec. 1984

R. S. Rivlin Feb. 1985 8 p
(Contract DAAG29-82-K-0026)
(AD-A153169; ARO-18595.5-MA) Avail: NTIS HC A02/MF A01 CSCL 20/4

The research carried out under the subject contract has been directed to the analysis of the manner in which the vorticity in an incompressible viscoelastic fluid propagates and decays. The fluids considered are such that for shearing flows the shear stress at an instant of time t depends linearly on the history of the velocity gradient in the fluid for all times up to and including t. Although in the problems considered most of the analysis is carried out for arbitrary linear dependence of the shear stress in the velocity gradient history, illustrative numerical results are obtained for the case when the fluid is Maxwellian and, for purposes of comparison, when it is Newtonian. GRA

N85-28270# Florida State Univ., Tallahassee. Geophysical Fluid Dynamics Inst.

THE EFFECT OF THE BENTHIC BOUNDARY LAYER ON THE PHYSICS OF INTENSE MESOSCALE EDDIES Ph.D. Thesis

G. Peggion Dec. 1984 146 p
(Contract N00014-82-C-0404)
(AD-A153193) Avail: NTIS HC A07/MF A01 CSCL 20/4

It is found that the decay of eddy-like flow occurs through conversion of kinetic to potential energy and through dissipation by bottom friction. The relative importance of both processes is expressed by the Rossby number and by the stratification parameter. A larger Rossby number and stratification parameter lead to a larger conversion of kinetic to potential energy, but a smaller mechanical dissipation of the same energy. Examination of the structure of the Benthic Boundary Layer indicates that a clear distinction should be made between the mixed layer, or the region neutrally stratified, and the Bottom Boundary Layer, or the region where most of the turbulent activity occurs. It is found that the structure of the Bottom Boundary Layer depends also on the

magnitude of the flow above the Benthic region, but the mixed layer depends also on the sign of the mesoscale activity. Under a cyclonic flow, the mixed layer is defined by vertical advection and it is usually much thicker than the Bottom Boundary Layer. The mixed layer of an anticyclonic flow is the result of both vertical advection and near bottom turbulence, and the ambiguity between the mixed layer and Bottom Boundary Layer is notably reduced. GRA

N85-28271# Virginia Polytechnic Inst. and State Univ., Blacksburg.
APPLICATION OF FORWARD SCATTERING RENORMALIZATION TO SCATTERING IN TURBID MEDIA Final Report, 16 Sep. 1983 - 15 Dec. 1984
D. A. DeWolf Jan. 1985 7 p
(Contract DAAG29-83-K-0164)
(AD-A153232; ARO-20705.2-GS) Avail: NTIS HC A02/MF A01 CSCL 20/6

The conventional wave-integral equation in electromagnetic scattering, consisting of a sum of directly-received vacuum field plus a scattered field that sums weighted vacuum spherical waves from each scatterer, is replaced by one in which renormalized fields containing part of the multiply-scattered energy replace the vacuum fields. A first-order approximation in the renormalization equation is applied to bistatic (large-angle) scattering from weak random fluctuations of the permittivity in a distant volume, and to a sparse monodisperse distribution of isotropic particles to yield scattering cross sections with extended validity for the direct polarization. A similar correction is introduced for the cross polarization in the case of backscatter. Differences with other calculations are noted. GRA

N85-28272# California Univ., Davis.
CONFORMATIONAL AND MECHANICAL PROPERTIES AT HIGH STRAIN RATES Final Report, 7 Dec. 1981 - 30 Apr. 1985
W. G. Hoover 1 Mar. 1985 7 p
(Contract DAAG29-82-K-0022)
(AD-A153401; ARO-18611.7-EG) Avail: NTIS HC A02/MF A01 CSCL 20/4

Several powerful means of studying steady flows far from equilibrium were developed. Gauss' Principle (minimizing the forces of constraint) was found to be useful for most problems, but leads to (small, 10%) errors when applied to heat flow simulations. Discovered were corresponding-states relations for the rate-dependent viscosity and flux-dependent heat conductivity which are useful in making macroscopic constitutive-equation estimates. Author (GRA)

N85-28273# Department of the Air Force, Washington, D.C.
HEAT PIPE AND METHOD OF MAKING SAME Patent Application
Ahern, inventor (to Air Force) Filed 6 Feb. 1985 15 p
(AD-D011654; US-Patent-Appl-SN-698957) Avail: NTIS HC A02/MF A01 CSCL 20/2

The present invention relates generally to semiconductor crystal growth, and, in particular, relates to a device used in an apparatus for crystal growth. The instant invention sets forth a heat pipe for crystal growth that is able to operate at high pressure/temperature. A cylindrical heat pipe for use in a crystal growth furnace has walls of tungsten with a layer of titanium deposited thereover to prevent oxidation. Strengthening members are placed between the walls to provide added strength. A wick structure of tungsten is used in the annular chamber to carry a working fluid of lithium. GRA

N85-28274# California Inst. of Tech., Pasadena. Dept. of Applied Mathematics.
CALTECH-DOE PROGRAM ON NUMERICAL ANALYSIS, COMPUTING AND FUNDAMENTAL STUDIES OF MOTION, ENERGY AND MASS TRANSFER IN FLUIDS Summary Report
1985 7 p refs
(Contract DE-AT03-76ER-72012)
(DE85-008106; DOE/ER-72012/T2; SR-2) Avail: NTIS HC A02/MF A01

A summary is presented for research in these areas: complex bifurcation, multigrid continuation methods in viscous flows, path-following studies, vortex dynamics, and motion of interfaces and fingering in Hele-Shaw cells. DOE

N85-28275# Conservation and Renewable Energy Inquiry and Referral Service, Silver Spring, Md.
ALTERNATIVE HEAT SOURCES FOR HEAT PUMPS
Sep. 1984 4 p
(DE85-007610; DOE/CE-0100) Avail: NTIS HC A02/MF A01; SOD HC

Solar assisted, water source, and ground source heat pumps are described as alternatives to air to air heat pumps for use in a broader range of climates. Publications for further information on these systems are listed. DOE

N85-28276# Transamerica Delaval, Inc., Santa Monica, Calif. Biphase Energy Systems.
FLOW CHARACTERISTICS OF A PARTIALLY SUBMERGED LIQUID PICKUP Final Report
D. Bartz 17 Feb. 1984 156 p refs
(Contract DE-AC03-80ER-10687)
(DE85-008744; DOE/ER-10687/T2) Avail: NTIS HC A08/MF A01

The technology for two-phase power production is discussed. The Biphase turbine is a state-of-the-art two-phase turbine with many potential advantages, including low cost, high efficency, high torque, and simplicity: The potential exists for substantial performance improvements. DOE

N85-28277# Oak Ridge Gaseous Diffusion Plant, Tenn. Computing and Telecommunications Div.
FLOWPLOT 2: A FLUID DYNAMICS AND HEAT TRANSFER PLOTTING PACKAGE
C. K. Cobb and J. N. Tunstall Apr. 1985 51 p refs
(Contract DE-AC05-84CT-21400)
(DE85-009802; K/CSD-TM-53) Avail: NTIS HC A04/MF A01

The FLOWPLOT II plotting program may be used with numerical or analytical fluid dynamics codes to create velocity vector plots, contour plots of up to three fluid parameters, and two-dimensional profile plots, three-dimensional curve plots, and/or three-dimensional surface plots for either the u or v velocity components. The FLOWPLOT II reads a data set written by the user's fluid dynamics code. This data set must contain parametric data at every nodal point of a uniform or nonuniform rectangular grid. The FLOWPLOT II uses the Display Integrated Software System and Plotting Language (DISSPLA) graphics package. The user has the option of generating plots on CALCOMP or Versatec plotters, creating a compressed plot data set which can be plotted on various plotting devices, or generating plots on microfiche. DOE

N85-28278# Technische Hogeschool, Delft (Netherlands). Dept. of Mathematics and Informatics.
STEADY, INCOMPRESSIBLE, INVISCID FLOW THROUGH A FINITE COLLAPSIBLE TUBE UNDER LONGITUDINAL TENSION
J. W. Reyn and P. G. Bakker 1984 42 p refs
(Rept-84-01) Avail: NTIS HC A03/MF A01

Steady, incompressible, inviscid flow through a collapsible tube under longitudinal tension held open at the ends is formulated as a two point boundary value problem for a nonlinear ordinary differential equation, describing the shape of the tube. Based on numerical calculations for various sets of values of total pressure Po and flow rate q, existence, uniqueness and multiplicity of solutions of the boundary value problem are discussed. When there is no flow, there is a unique solution for all tube lengths for $Po < 1$; for $Po > 1$ there is a unique solution for tube lengths up to that allowed, corresponding to the maximum inflation. For subcritical total pressures and negative inlet pressures there is a collapsed and a highly collapsed solution, which merge at the flow limitation flow rate value. For subcritical total pressures and positive inlet pressures, the occurrence of periodic solutions leads

to multiplicity in the solution of the boundary value problem.
Author (ESA)

N85-28279# Technische Hogeschool, Delft (Netherlands). Dept. of Mathematics and Informatics.
A COUNTERPART OF FAXEN'S FORMULA IN POTENTIAL FLOW
P. vanBeek 1984 12 p refs
(Rept-84-09) Avail: NTIS HC A02/MF A01

An expression for the acceleration of a sphere in a potential fluid is derived in terms of the local incident flow field, without posing any restriction upon the latter. The expression is exact, i.e., the effect of all spatial derivatives of the incident velocity field is taken into account. Author (ESA)

N85-28280# Technische Hogeschool, Delft (Netherlands). Dept. of Mathematics and Informatics.
A SECOND-ORDER PRESSURE-CORRECTION METHOD FOR VISCOUS INCOMPRESSIBLE FLOW
J. vanKan 1984 40 p refs
(Rept-84-15) Avail: NTIS HC A03/MF A01

An ADI scheme with pressure correction which is second order consistent in space and time is presented. It is shown that the pressure correction method in a system of constrained ordinary differential equations under reasonably weak assumptions leads to a solution with 0 (Delta t sq) accuracy. It is proved that in a linearized simplified case pressure correction does not affect the unconditional stability of the underlying scheme. Application to flow in a glass furnace is illustrated. Author (ESA)

N85-28281# Technische Hogeschool, Delft (Netherlands). Dept. of Mathematics and Informatics.
FLOW THROUGH FINITE COLLAPSIBLE TUBES: A BRANCHING PROBLEM
J. W. Reyn and J. G. Besjes 1984 35 p refs
(Rept-84-29) Avail: NTIS HC A03/MF A01

Steady, incompressible, inviscid flow through a collapsible tube under longitudinal tension and held open at the ends was formulated as a two-point boundary value problem for a nonlinear ordinary differential equation, describing the shape of the tube. Analytical solutions close to rho (Xi) identical with 1 are investigated for Po > 1/4 P'. The nature of the solutions is explored using the method of harmonic balance. A possible branching from rho (Xi) identical with 1 of solutions with variation of lambda identical with q sq - Po is indicated and asymptotic expansions in lambda are calculated. The Lyapunov-Schmidt method is used to check calculations and branching behavior. Author (ESA)

N85-28282# Technische Hogeschool, Delft (Netherlands). Dept. of Mathematics and Informatics.
LIMITING PROFILES IN CONTAMINANT TRANSPORT THROUGH POROUS MEDIA
C. J. vanDuyn and J. M. Degraaf (Leiden Univ.) 1984 37 p refs
(Rept-84-31) Avail: NTIS HC A03/MF A01

The degenerate nonlinear diffusion problem Beta (u) sub t + u sub x = u sub xx t > 0, x between minus and positive infinity, u(x,0) = u sub 0 (x) is investigated. For a special choice of Beta (Beta (u) = u sup p, p > 0) the equation describes the one-dimensional transport of contaminant in a fluid flow through a homogeneous staturated porous medium. The large time behavior of the solution is studied for more general Beta. Depending upon the shape of Beta (convex or concave) and the values u0 (- inf) and u0 (+ inf) the solution converges to a traveling wave g of the form g(x-at) or to a function w* of the form w* (x/t+1).
Author (ESA)

N85-28283# Technische Hogeschool, Delft (Netherlands). Dept. of Mathematics and Informatics.
A NAVIER-STOKES CAPILLARY FREE BOUNDARY IN OPEN BOAT CRYSTAL GROWTH
C. Cuvelier and J. M. Driessen 1984 16 p refs Submitted for publication
(Rept-84-34) Avail: NTIS HC A02/MF A01

A method for finding stationary capillary free boundaries in viscous liquid flow was derived and was used for the computation of a free boundary in an open boat crystal growth model. A shape of the free boundary is assigned and the flow field within that shape is calculated after disregarding one of the boundary conditions on the free boundary. Next a new shape of the free boundary is computed which satisfies as closely as possible the boundary condition that was relaxed. This procedure is repeated until convergence is attained. The influence of buoyancy and thermocapillary forces are considered. Author (ESA)

N85-28284# Center for Mathematics and Computer Science, Amsterdam (Netherlands). Dept. of Applied Mathematics.
TIDAL RECTIFICATION IN LATERAL VISCOUS BOUNDARY LAYERS OF A SEMIENCLOSED BASIN
H. E. deSwart and J. T. F. Zimmerman (Netherlands Institute of Sea Research) Nov. 1984 18 p refs Submitted for publication Sponsored by Netherlands Foundation for Technical Sciences (CWI-AM-R8415; B8478808) Avail: NTIS HC A02/MF A01

The rectified flow, induced by divergence of the vorticity flux in lateral oscillatory viscous boundary layers along the side-walls of a semienclosed basin, is studied as a function of the Strouhal number, equivalent to the Reynolds number. It is shown that for small Strouhal numbers the ratio of the rectified flow and the tidal current amplitude is proportional to the number but for larger values the behavior is exponential. The latter conclusion is reached using a global renormalization of the vorticity equation.
Author (ESA)

N85-28285# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Goettingen (West Germany). Inst. fuer Theoretische Stroemungsmechanik.
BOUNDARY LAYER AND PARABOLIC FLOWS
Roger Grundmann Oct. 1984 109 p refs In GERMAN; ENGLISH summary Report will also be announced as translation (ESA-TT-918)
(DFVLR-FB-84-46; ISSN-0171-1342) Avail: NTIS HC A06/MF A01; DFVLR, Cologne DM 32

Calculation methods for two and three-dimensional, laminar, turbulent and transitional, compressible and incompressible and rotating boundary layer flows, and calculation methods for three-dimensional, laminar, compressible and incompressible and rotating parabolic flows are presented. Systems of equations for arbitrary surface-oriented coordinate systems developed by tensor calculation methods are used. Author (ESA)

N85-27945*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
SIMULATION OF MULTISTAGE TURBINE FLOWS
M. L. Celestina (Sverdrup Technology, Inc., Middleburg Heights, Ohio), R. A. Mulac (Sverdrup Technology, Inc., Middleburg Heights, Ohio), and John J. Adamczyk *In its* Struct. Integrity and Durability of Reusable Space Propulsion Systems May 1985 p 27-36 (For primary document see N85-27941 17-20)
Avail: NTIS HC A09/MF A01 CSCL 20D

N85-27946*# Cleveland State Univ., Ohio.
UNSTEADY FLOW IN MULTISTAGE TURBINES Abstract Only
Surya P. Surampudi *In* NASA. Lewis Research Center Struct. Integrity and Durability of Reusable Space Propulsion Systems May 1985 p 37-38 refs (For primary document see N85-27941 17-20)
Avail: NTIS HC A09/MF A01 CSCL 20D

N85-27947*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
UNSTEADY HEAT TRANSFER DUE TO TIME-DEPENDENT FREE STREAM VELOCITY Abstract Only
Rama S. R. Gorla and Ali Ameri *In* NASA. Lewis Research Center Struct. Integrity and Durability of Reusable Space Propulsion Systems May 1985 p 39-40 refs (For primary document see N85-27941 17-20)
Avail: NTIS HC A09/MF A01 CSCL 20D

N85-27948*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
NEW FACILITY TO STUDY UNSTEADY WAKE EFFECTS ON TURBINE AIRFOIL HEAT TRANSFER
Robert J. Simoneau *In its* Struct. Integrity and Durability of Reusable Space Propulsion Systems May 1985 p 41-47 (For primary document see N85-27941 17-20)
Avail: NTIS HC A09/MF A01 CSCL 20D

N85-27949*# Calspan - State Univ. of New York Joint Venture, Buffalo, N.Y.
EXPERIMENTAL MEASUREMENTS AND ANALYSIS OF HEAT TRANSFER AND GAS DYNAMICS IN A ROTATING TURBINE STAGE Abstract Only
M. G. Dunn, W. J. Rae, and W. K. George *In* NASA. Lewis Research Center Struct. Integrity and Durability of Reusable Space Propulsion Systems May 1985 p 49-52 refs (For primary document see N85-27941 17-20)
Avail: NTIS HC A09/MF A01 CSCL 20D

N85-27950*# United Technologies Research Center, East Hartford, Conn.
CALCULATION OF VISCOUS COMPRESSIBLE FLOWS IN SMALL GAS TURBINES Abstract Only
O. L. Anderson and G. D. Power *In* NASA. Lewis Research Center Struct. Integrity and Durability of Reusable Space Propulsion Systems May 1985 p 53-57 refs (For primary document see N85-27941 17-20)
Avail: NTIS HC A09/MF A01 CSCL 20D

N85-27951*# Argonne National Lab., Ill.
FLOW-INDUCED VIBRATION OF SSME MAIN INJECTOR LIQUID-OXYGEN POSTS Abstract Only
S. S. Chen, J. A. Jendrzejczyk, and M. W. Wambsganss *In* NASA. Lewis Research Center Struct. Integrity and Durability of Reusable Space Propulsion Systems May 1985 p 59-61 (For primary document see N85-27941 17-20)
Avail: NTIS HC A09/MF A01 CSCL 20D

N85-28156# Joint Publications Research Service, Arlington, Va.
IMPACT STARTING OF PLANE NOZZLES WITH WIDE DIVERGENCE ANGLE Abstract Only
A. B. Britan and Ye. I. Vasilyev *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-85-004) 15 May 1985 p 81 Transl. into ENGLISH from Izv. Akad. Nauk SSSR: Mekhan. Zhidkosti i Gaza (Moscow), no. 4, Jul. - Aug. 1984 p 100-106 (For primary document see N85-28142 17-31)
Avail: NTIS HC A06/MF A01

N85-28157# Joint Publications Research Service, Arlington, Va.
BUILDUP OF OSCILLATION OF BODIES IN STRATIFIED FLUID Abstract Only
I. S. Dolina *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-85-0004) 15 May 1985 p 81 Transl. into ENGLISH from Izv. Akad. Nauk SSSR: Mekhan. Zhidkosti i Gaza (Moscow), no. 4, Sep. - Oct. 1984 p 87-93 (For primary document see N85-28142 17-31)
Avail: NTIS HC A06/MF A01

N85-28159# Joint Publications Research Service, Arlington, Va.
PROPULSION EFFICIENCY OF VIBRATING BODIES IN SUBSONIC GAS STREAM Abstract Only
M. N. Kogan and M. V. Ustinov *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-85-004) 15 May 1985 p 83 Transl. into ENGLISH from Izv. Akad. Nauk SSSR: Mekhan. Zhidkosti i Gaza (Moscow), no. 4, Jul. - Aug. 1984 p 128-132 Original language document was announced in IAA as A85-10111 (For primary document see N85-28142 17-31)
Avail: NTIS HC A06/MF A01

35 INSTRUMENTATION AND PHOTOGRAPHY

Includes remote sensors; measuring instruments and gages; detectors; cameras and photographic supplies; and holography.

For aerial photography see *43 Earth Resources.* For related information see also *06 Aircraft Instrumentation,* and *19 Spacecraft Instrumentation.*

N85-28286*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
THERMAL INFRARED MULTISPECTRAL SCANNER (TIMS): AN INVESTIGATOR'S GUIDE TO TIMS DATA
Frank D. Palluconi and Gerald R. Meeks (NASA. Earth Resources Lab.) 1 Jun. 1985 32 p
(Contract NAS7-918)
(NASA-CR-175875; JPL-Pub-85-32; NAS 1.26:175875) Avail: NTIS HC A03/MF A01 CSCL 14B

The Thermal Infrared Multispectral Scanner (TIMS) is a NASA aircraft scanner providing six channel spectral capability in the thermal infrared region of the electromagnetic spectrum. Operating in the atmospheric window region (8 to 12 micrometers) with a channel sensitivity of approximately 0.1 C, TIMS may be used whenever an accurate measure of the Earth's surface is needed. A description of this scanner is provided as well as a discussion of data acquisition and reduction. Author

N85-28287# Naval Research Lab., Washington, D. C.
PROCEEDINGS OF THE FIFTEENTH ANNUAL PRECISE TIME AND TIME INTERVAL (PTTI) APPLICATIONS AND PLANNING MEETING
James A. Murray, Jr., ed. 2 Apr. 1984 745 p refs Meeting held in Washington, D.C., 6-8 Dec. 1983; sponsored by NASA. Goddard Space Flight Center, Naval Observatory, Naval Electronic Systems Command, NRL, Defense Communications Agency, Chief of Naval Operations, NBS, Army Electronics Technology and Devices Lab., and RADC
(AD-A149163) Avail: NTIS HC A99/MF E03 CSCL 14/2

Various studies and methods of time signal synchronization are presented. Many deal with services provided by the National Bureau of Standards or the U.S. Naval Observatory and employ reference time signals from the global positioning system. For individual titles, see N85-28288 through N85-28324.

N85-28288# Shaanxi Astronomical Observatory, Lintong (China).
TIMING ACCURACY OF LF AND TV SYNCHRONIZATION TECHNIQUES
Miso Yun-rui and Pan Xiao-pei *In* NRL Proc. of the 15th Ann. Precise Time and Time Interval (PTTI) Appl. and Planning Meeting 2 Apr. 1985 p 9-16 refs (For primary document see N85-28287 17-35)
Avail: NTIS HC A99/MF E03 CSCL 14/2

Low frequency and television synchronization techniques have been widely used in China for several years. Shaanxi, Shanghai and Beijing Astronomical Observatories have cooperated with the U.S. Naval Observatory in making two portable clock calibration experiments in 1981 and 1982. The results indicate that the LF synchronization method can reach a timing accuracy of + or - 1 microseconds and a precision of + or - 0.05 microseconds to + or - 0.20 microseconds over a range of 2000 km with complex mixed paths. In addition, it has been found that there is a systematic difference of about 4 microseconds between USNO and other laboratories via the North-West Pacific Loran-C chain. The experiment also shows that the timing accuracy for the passive TV synchronization method is about + or - 1 microseconds and the prevision of daily frequency calibrations is better than 2 parts in 10 to the 12th. Author (GRA)

N85-28289# National Bureau of Standards, Boulder, Colo. Time and Frequency Div.
NEW TIME AND FREQUENCY SERVICES AT THE NATIONAL

BUREAU OF STANDARDS
S. R. Stein, G. Kamas, and D. W. Allan *In* NRL Proc. of the 15th Ann. Precise Time and Time Interval (PTTI) Appl. and Planning Meeting 2 Apr. 1984 p 17-27 refs (For primary document see N85-28287 17-35)
Avail: NTIS HC A99/MF E03 CSCL 14/2

The two new measurement services offered in 1983 extend the range and capability of the other frequency and time services offered by NBS: telephone time of day; high frequency broadcasts (WWV and WWVH); low frequency broadcast (WWVB), the GOES satellite time code; and laboratory calibrations. These services previously provided routine time synchronization capability in the one second to 25 microsecond range. The new services offer enhanced automation and a greater confidence in the results of the measurements. In addition, NBS provides consultation to assist the user in selecting the best solution to his problems, initial training and follow-up consultation whenever measurement problems are detected. The new time and frequency services provide traceability to NBS and a direct link to one of the world's best time scales. They greatly reduce the need for the user to become an expert on the interacacies of navigation systems such as LORAN-C and GPS. The systems reliability will be high because all the components are off-the-shell commercial equipment and because NBS maintains the systems to minimize hardware failures. GRA

N85-28290# National Bureau of Standards, Boulder, Colo. Time and Frequency Div.
RECENT IMPROVEMENTS IN THE ATOMIC TIME SCALES OF THE NATIONAL BUREAU OF STANDARDS
D. W. Allan, D. J. Glaze, J. E. Gray, R. H. Jones, J. Levine, and S. R. Stein *In* NRL Proc. of the 15th Ann. Precise Time and Time Interval (PTTI) Appl. and Planning Meeting 2 Apr. 1984 p 29-40 refs (For primary document see N85-28287 17-35)
Avail: NTIS HC A99/MF E03 CSCL 14/2

Coincident with the installation of a new measurement system, the national Bureau of Standards has also developed a new philosophy for the generation of both UTV(NBS) and atomic time, TA(NBS). Several benefits have resulted from this new direction, First, a more uniform UTC(NBS) scale was achieved in order to meet the increased requirements of our users. Second, improved synchronization of UTC(NBS) with UTC (Universal Time Coordinated) has been achieved. The frequency stability of UTC(NBS) is typically about 1 x 10 to the minus 14th power for averaging times of one day and longer and synchronism is now maintained to within about 1 microsecond of UTC indefinitely. Previously five microseconds was a realistic goal. Third, a new Kalman type algorithm with more robust performance is used to generate TA(NBS) totally independent of the generation of UTC(NBS). Fourth, a significantly improved working time and frequency reference is readily available. And fifth, a very stable frequency reference is obtained by using all of the clocks available in the NBS clock ensemble. GRA

N85-28291# Naval Observatory, Washington, D.C.
AUTOMATION OF PRECISE TIME REFERENCE STATIONS (PTRS)
Paul J. Wheeler *In* NRL Proc. of the 15th Ann. Precise Time and Time Interval (PTTI) Appl. and Planning Meeting 2 Apr. 1985 p 41-52 (For primary document see N85-28287 17-35)
Avail: NTIS HC A99/MF E03 CSCL 14/2

The U.S. Naval Observatory is presently engaged in a program of automating precise time stations (PTS) and precise time reference stations (PTBS) by using a versatile mini-computer controlled data acquisition system (DAS). The data acquisition system is configured to monitor locally available PTTI signals such as LORAN-C, OMEGA, and/or the Global Positioning System. In addition, the DAS performs local standard intercomparison. Computer telephone communications provide automatic data transfer to the Naval Observatory. Subsequently, after analysis of the data, results and information can be sent back to the precise time reference station to provide automatic control of remote station timing. The DAS configuration is designed around state of the art standard industrial high reliability modules. The system integration and software are standardized but allow considerable flexibility to satisfy special local requirements such as stability measurements, performance evaluation and printing of messages and certificates. The DAS operates completely independently and may be queried or controlled at any time with a computer or terminal device (control is protected for use by authorized personnel only). Such DAS equipped PTS are operational in Hawaii, California, Texas and Florida. Author (GRA)

N85-28292# Naval Observatory, Washington, D.C.
US NAVAL OBSERVATORY COLLECTION AND UTILIZATION OF TIME COMPARISON DATA
F. Neville Withington *In* NRL Proc. of the 15th Ann. Precise Time and Time Interval (PTTI) Appl. and Planning Meeting 2 Apr. 1985 p 53-70 refs (For primary document see N85-28287 17-35)
Avail: NTIS HC A99/MF E03 CSCL 14/2

Through the years, the amount of PTTI data collected by, disseminated through and utilized at the U.S. Naval Observatory has steadily grown. Approximately 10 years ago, the USNO began computerizing collection and reduction of these data. At that time this process was automated as much as possible, given the technical constraints involved. In the last few years, the advent of more sophisticated equipment and techniques has improved and further automated data handling. Not only has data collection been modernized, but new systems for disseminating data, bulletins, and other information have been introduced and are being developed. This paper is an overview of the development of automated PTTI data handling at the Naval Observatory, generally describes the current data handling practices, and briefly discusses near future trends in the management of data. Author (GRA)

N85-28293# Tokyo Astronomical Observatory (Japan).
INTERNATIONAL TIME COMPARISON BY A GPS TIMING RECEIVER
M.-K. Fujimoto, K. Fujiwara, and S. Aoki *In* NRL Proc. of the 15th Ann. Precise Time and Time Interval (PTTI) Appl. and Planning Meeting 2 Apr. 1985 p 71-82 refs (For primary document see N85-28287 17-35)
Avail: NTIS HC A99/MF E03 CSCL 14/2

Tokyo Astronomical Observatory (TAC) has started a regular reception of the Global Positioning System (GPS) timing signals for the purpose of a precise international time comparison. A test operation of the GPS receiver was performed from September 1982 to January 1983 and achieved good accuracy in time comparisons. During the test run, a clock comparison was made by a USNO portable clock team and it was compared with the GPS reception. The difference between the comparisons was less than the error in the portable clock comparison. Since April 1983, regular reception of GPS signals has continued and the results in the GPS time error, UTC(TAO)-GPS, are transmitted every week on the General-electric (GE) Mark III system. By this means, the cesium clocks in the Asian region will be related to TAI with better accuracies. Author (GRA)

N85-28294*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
FIRST RESULTS OF GPS TIME TRANSFER TO AUSTRALIA
John M. Luck (Division of National Mapping), John R. Woodger (Division of National Mapping), James E. Wells (ACT), Peter N. Churchill (ACT), and Philip A. Clements *In* NRL Pro. of the 15th Ann. Precise Time and Time Interval (PTTI) Appl. and Planning Meeting 2 Apr. 1985 p 87-112 refs (For primary document see N85-28287 17-35)
Avail: NTIS HC A99/MF E03 CSCL 14/2

A Global Positioning System time transfer unit built by NBS under contract to JPL was installed at Tidbinbilla Deep Space Communications Complex of the NASA Deep Space Network in June 1983. It has been used to estimate the relationship to UTC(USNO MC) of the Tidbinbilla frequency and time system TID(FTS) based on a hydrogen maser, and thence to estimate the performance of the Australian free-running time scale UTC (AUS). Data from the first three months has been analyzed three ways: by two-hop common view using JPL as intermediary; by

long-arc interpolation of measurements against space vehicle clocks; and by long-arc interpolation of GPS-Time results. Residuals from a single quadratic fit through three months of UTC(USNO MC) - TID (FTS) results were white noise with standard error 15 ns, and a flying clock measurement gave 70 ns agreement. A straight line fit through results UTC(USNO MC) - UTC (AUS) gave 90 ns standard error and 120 bns agreement. It is proposed to use the GPS measurements to steer UTS(AUS) to UTC(BIH), and to rename the existing time scale TA(AUS). Author (GRA)

N85-28295# National Bureau of Standards, Boulder, Colo. Time and Frequency Div.

SEPARATING THE VARIANCES OF NOISE COMPONENTS IN THE GLOBAL POSITIONING SYSTEM c04

D. W. Allan and M. Weiss *In* NRL Proc. of the 15th Ann. Precise Time and Time Interval (PTTI) Appl. and Planning Meeting 2 Apr. 1984 p 115-131 (For primary document see N85-28287 17-35) (AD-P004578) Avail: NTIS HC A99/MF E03 CSCL 14/2

Central to the success of the GPS program is the ability to model the frequency stability characteristics of the various components. A perfistent challenge in evaluating the Global Positioning System in the separation of the errors of the satellite clocks from those due to the satellite ephemeris errors and/or the signal propagation delay errors. This information is important when one tries to improve the performance of the Global Positioning System. It is necessary to know if a particular component of the system meets spcification and which component(s) limits performance. Although one cannot separate the errors themselves, a method has been developed whereby the Allen variances of critical components to the GPS can be separated. Using a reference clock such as UTC(NES) or UTC(USNO), for example, the fractional frequency stability of each of the following can be separated from each of the others; the reference clock, the space vehicle clock, the GPS clock, the clock upload correction, the ephemeris and the propagation delay. This technique has the potential to significantly assist in properly setting the parameters to obtain optimum performance from the Global Positioning System, e.g., setting the Kalman filter parameters. Results will be given showing some interesting surprises in the characteristics of the system. Author (GRA)

N85-28296# Stanford Telecommunications, Inc., Santa Clara, Calif.

ENHACEMENTS TO THE TTS-502 TIME TRANSFER SYSTEM

A. J. vanDierendonck and Q. D. Hua *In* NRL Proc. of the 15th Ann. Precise Time and Time Interval (PTTI) Appl. and Planning Meeting 2 Apr. 1985 p 133-153 refs (For primary document see N85-28287 17-35)

Avail: NTIS HC A99/MF E03 CSCL 14/2

Two years ago STI introduced an affordable, relatively compact time transfer system on the market -- the TTS-502, and described that system at the 1981 PTTI conference. Over the past few months, that system has been improved, and new features have been added. In addition, new options have been made available to further enhance the capabilities of the system. These enhancements include the addition of a positioning algorithm and new options providing a corrected 5 MHz output that is phase coherent with the 1 pps output, and providing an internal Rubidium Oscillator. The Positioning Algorithm was developed because not all time transfer users had the luxury of the Defense Mapping Agency's (DMA) services for determining their position in WGS-72 coordinates. The enhanced TTS-502 determines the GPS position anywhere in the world, independent of how many GPS satellites are concurrently visible. However, convergence time to a solution is inversely proportional to the number of satellites concurrently visible and the quality of frequency standard used in conjunction with the TTS-502. Real World solution results will be presented for a variety of cases and satellite scheduling scenarios. Typically, positioning accuracies were achieved better than 5 to 10 meters r.s.s. using the C/A code only at Sunnyvale, California. GRA

N85-28297# Trimble Navigation, Mountain View, Calif.

A NEW PRECISION TIME AND FREQUENCY SOURCE FOR STATIONARY PTTI APPLICATIONS

Javad M. Ashjaee, Roger J. Helkey, and Ron C. Hyatt *In* NRL Proc. of the 15th Ann. Precise Time and Time Interval (PTTI) Appl. and Planning Meeting 2 Apr. 1985 p 155-169 refs (For primary document see N85-28287 17-35)

Avail: NTIS HC A99/MF E03 CSCL 14/2

The highly stable, accurate navigation signals provided by the GPS satellite navigation system are utilized in a new time and frequency source presently in the final stages of development. Integration of the latest technology in component quartz oscillations and digital electronics with a low cost, C/A receiver provides frequency and timing signals with exceptional stability and accuracy at a very cost effective level. A description of the product and results of key performance measurements will be presented in this paper. Author (GRA)

N85-28298# Naval Research Lab., Washington, D. C.

ON-ORBIT FREQUENCY STABILITY ANALYSIS OF THE GPS NAVSTAR'S 3 AND 4 RUBIDIUM CLOCKS AND NAVSTAR'S 5 AND 6 CESIUM CLOCKS

Thomas B. McCaskill, James A. Buisson, and Sarah B. Stebbins *In its* Proc. of the 15th Ann. Precise Time and Time Interval (PTTI) Appl. and Planning Meeting 2 Apr. 1985 p 171-209 refs (For primary document see N85-28287 17-35)

Avail: NTIS HC A99/MF E03 CSCL 14/2

This paper describes the on-orbit frequency stability performance analysis of the GPS NAVSTARs 3 and 4 rubidium clocks, and the NAVSTARs 5 and 6 cesium clocks. Time-domain measurements, taken from the four GPS monitor sites, have been analyzed to estimate the short- and long-term frequency stability performance of the NAVSTAR clocks. The data analyzed includes measurements from 1981, 1982, and the first 100 days of 1983. Short- and long-term results are presented for data collected during 1982. The Allan variance was used as the measure of frequency stability performance in the time domain. Author (GRA)

N85-28299*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

CPS NAVIGATION EXPERIMENT USING HIGH PRECISION GPS TIMING RECEIVERS

J. A. Buisson (NRL), O. J. Oaks (NRL), M. J. Lister (NRL), S. C. Wardrip, S. Leschiutta (Politecnico di Torino), P. G. Galliano (Istituto Elettrotecnico Nazionale), D. Cordara (Istituto Elettrotecnico Nazionale), V. Pettiti (Istituto Elettrotecnico Nazionale), E. Detoma (Bendix Field Engineering Corp.), P. Dachel (Bendix Field Engineering Corp) et al *In* NRL Proc. of the 15th Ann. Precise Time and Time Interval (PTTI) Appl. and Planning Meeting 2 Apr. 1985 p 211-235 refs (For primary document see N85-28287 17-35)

Avail: NTIS HC A99/MF E03 CSCL 14B

Global Positioning System (GPS) Time Transfer receivers were developed by the Naval Research Laboratory (NRL) to provide synchronization for the NASA Global Laser Tracking Network (GLTN). The capabilities of the receiver are being expanded mainly through software modification to: Demonstrate the position location capabilities of a single channel receiver unsign the GPS C/A code; and Demonstrate the time/navigation capability of the receiver onboard a moving platform, by sequential tracking of GPS satellites. GRA

N85-28300# Naval Observatory, Washington, D.C.

IMPROVED MASTER CLOCK REFERENCE SYSTEM AT USNO

Gernot M. R. Winkler *In* NRL Proc. of the 15th Ann. Precise Time and Time Interval (PTTI) Appl. and Planning Meeting 2 Apr. 1985 p 237-248 ref (For primary document see N85-28287 17-35)

Avail: NTIS HC A99/MF E03 CSCL 14/2

The first phase of the NAVELEX/NRL/USNO Master Clock (MC) upgrade program has been completed with the delivery of two VLG11B hydrogen Masers to the U.S. Naval Observatory (USNO). After installation in a specially prepaid Maser Laboratory with redundant environmental control, and a ten-day burn-in operation, the masers were independently tuned. Their subsequent performance caused a review of our plans for their operational use as part of the USNO MC complex. A revised concept is the basis for system integration presently in progress. Author (GRA)

N85-28301# Aerospace Corp., El Segundo, Calif.
THE STEERING OF GPS TIME
H. F. Fliegel *In* NRL Proc. of the 15th Ann. Precise Time and Time Interval (PTTI) Appl. and Planning Meeting 2 Apr. 1984 p 249-267 refs (For primary document see N85-28287 17-35)
Avail: NTIS HC A99/MF E03

The NAVSTAR Global Positioning System (GPS) will be one of the most widely available means by which to distribute exact time. GPS time will be steered by altering its adopted offset bias and drift from a reference clock. This paper summarizes the mathematics of the steering algorithm, and the interface between the USNO and the GPS controller. GRA

N85-28302# Edgerton, Germeshausen and Grier, Inc., Salem, Mass.
TEST RESULTS FOR PROTOTYPE GPS RUBIDIUM CLOCKS
T. J. Lynch and W. J. Riley *In* NRL Proc. of the 15th Ann. Precise Time and Time Interval (PTTI) Appl. and Planning Meeting 2 Apr. 1985 p 269-280 (For primary document see N85-28287 17-35)
Avail: NTIS HC A99/MF E03 CSCL 14/2

This paper presents the results of a series of stability and qualification-level environmental and performance tests on two prototpye rubidium frequency standards for the GPS navigation satellite program. GRA

N85-28303*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
INTERNATIONAL TIME TRANSFER AND PORTABLE CLOCK EVALUATION USING GPS TIMING RECEIVERS: PRELIMINARY RESULTS
S. C. Wardrip, J. A. Buisson (NRL), O. J. Oaks (NRL), M. J. Lister (NRL), E. Detoma (Bendix Field Engineering Corp.), P. Dachel (Bendix Field Engineering Corp.), T. Stalder (Bendix Field Engineering Corp.), H. Warren (Bendix Field Engineering Corp.), G. M. R. Winkler (Naval Observatory), and G. Luther (Naval Observatory) *In* NRL Proc. of the 15th Ann. Precise Time and Time Interval (PTTI) Appl. and Planning Meeting 2 Apr. 1985 p 283-330 refs (For primary document see N85-28287 17-35)
Avail: NTIS HC A99/MF E03 CSCL 14B

The overall experiment was designed to test the positioning and navigation capabilities of the GPS timing receivers developed by the Naval Research Laboratory (NRL) for the NASA Goddard Laser Tracking Network (GITN). To perform this experiment, a reliable and redundant time scale was set up onboard the ship, and a back-up on shore. This situation provided the opportunity to perform simultaneously a timing experiment ideally divided into two parts, the main objectives of the experimentation being: (1) To test GPS timing receiver synchronization capabilities on a moving platform, and to perform an intercontinental synchronization via GPS between participating international timing laboratories in Europe and in the United States. (2) To evaluate the performance of cesium portable clocks in the field. GRA

N85-28304# Stuttgart Univ. (West Germany). Inst. fuer Navigation.
SPREAD SPECTRUM TIME TRANSFER EXPERIMENT VIA INTELSAT
P. Hartl, L. Veenstra (COMSAT Labs.), N. Gieschen (Berlin Univ.), K.-M. Mussener (Berlin Univ.), W. Schafer (Berlin Univ.), C.-M. Wende (Berlin Univ.), W. Klepczynski (USNO), H.-H. Nau (DFVLR, Oberpfaffenhofen, West Germany), and R. Stoiber (DFVLR, Oberpfaffenhofen, West Germany) *In* NRL Proc. of the 15th Ann. Precise Time and Time Interval (PTTI) Appl. and Planning Meeting 2 Apr. 1985 p 331-356 (For primary document see N85-28287 17-35)
Avail: NTIS HC A99/MF E03 CSCL 14/2

A two-way time synchronization experiment was performed in July 1983, between Washington, D.C. and Oberpfaffenhofen, Federal Republic of Germany. The experiment used the 14/11-GHz transponders on the INTELSAT V Atlantic spacecraft. The MITRED (Microwave Time and Ranging Experiment) modem designed, developed, and constructed at the Technical University of Berlin was employed. The experiment was jointly conducted by COMSAT Laboratories and the Institute for Nachrichtentechnik, DFVLR, Oberpfaffenhofen, FRG, in cooperation with the United States Naval Observatory and the Institut fur Luft- und Raumfahrt, TU Berlin. The spread spectrum signal occupied a bandwidth of 4 MHz and used the power normally required by a single-voice carrier. The ground stations involved had parabolic dishes of 2.4 m (G/T = 20 dB/K) and 4.5 m (G/T = 26 dB/K). In the 4-MHz occupied bandwidth, the carrier-to-noise ratio was -11 dB. At this power level, the time transfer performance had rms-standard deviations of better than 1 ns. The experimental results confirm that an international time transfer and clock synchronization network using communications satellite is economically viable when using a spread spectrum transmission format. Author (GRA)

N85-28305# Naval Research Lab., Washington, D. C. Center for Space Research.
UNATTENDED TV TIME TRANSFER RESULTS
John A. Waak and John H. Spencer *In its* Proc. of the 15th Ann. Precise Time and Time Interval (PTTI) Appl. and Planning Meeting 2 Apr. 1985 p 357-369 refs (For primary document see N85-28287 17-35)
Avail: NTIS HC A99/MF E03 CSCL 14/2

This article reports on the results of more than eight thousand relative television time transfers to Maryland Point Observatory over a 14 month period beginning in December 1981. The data were taken at intervals of 30-60 minutes using a Hewlett-Packard 1000 computer operating in an unattended mode. After correction for linear drifts of our maser with respect to the master clock of the USNO, the results are internally consistent to within roughly + or - 65 nsec over time spans up to three months, under the assumption of invariant propagation delay. The major disadvantages to this method of time transfer are the relatively poor precision and the dependency upon constant propagation times. GRA

N85-28306*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
THE ROLE OF A LOW EARTH ORBITER IN INTERCONTINENTAL TIME SYNCHRONIZATION VIA GPS SATELLITES
Sien-Chong Wu and V. John Ondrasik *In* NRL Proc. of the 15th Ann. Precise Time and Time Interval (PTTI) Appl. and Planning Meeting 2 Apr. 1985 p 371-388 refs (For primary document see N85-28287 17-35)
Avail: NTIS HC A99/MF E03 CSCL 14B

Time synchronization between two sites using differential GPS has been investigated by a number of researchers. When the two sites are widely separated, the common view period of any GPS satellite becomes shorter; low elevation observations are inevitable. This increase the corrupting effects of the atmospheric delay and, at the same time, narrows the window for such time synchronization. This difficulty can be alleviated by synchronization. This difficulty can be alleviated by using a transit site located midway between the two main sites. The main sites can now look at different GPS satellites which are also in view at the transit site. However, a ground transit site may not always be conveniently available, especially across the Pacific Ocean; also, the inclusion of a ground transit site introduce additional errors due to its location error and local atmospheric delay. An alternative is to use a low Earth orbiter (LEO) as the transit site. A LEO is superior to a ground transit site in three ways: (1) it covers a large part of the Earth in a short period of time and, hence, a single LEO provides worldwide transit services; (2) it is above the troposphere and thus its inclusion does not introduce additional tropospheric delay error; and (3) it provides strong dynamics needed to improve GPS satellite positions which are of importance to ultraprecise time synchronization. Author (GRA)

N85-28307# European Space Agency. European Space Operations Center, Darmstadt (West Germany).
TIMING OF SPACECRAFT DATE: TIME ACCURACY REQUIREMENTS AND TIMING FACILITIES OF THE EUROPEAN SPACE AGENCY (ESA)
H. P. Dworak *In* NRL Proc. of the 15th Ann. Precise Time and

Time Interval (PTTI) Appl. and Planning Meeting 2 Apr. 1985 p 389-410 (For primary document see N85-28287 17-35)
Avail: NTIS HC A99/MF E03 CSCL 14/2

The time accuracy requirements for various European Space Agency (ESA) missions are analyzed; the requirements are grouped by the type of mission. The evolution of satellite timing techniques since 1968 is shown, and the requirements for future ESA missions (until the late 1980's) are assessed. Timing systems and their configuration at various ESA ground stations and the operations control centers are described. Two studies on future techniques in the field of time dissemination and time synchronization conclude this paper: The LASSO mission (Laser Synchronization from Stationary Orbit) and a low-cost time dissemination technique using METEOSAT, the European meteorological satellites, are briefly outlined. GRA

N85-28308# Kode, Inc., Tustin, Calif.
UHF IRIG G DISTRIBUTION SYSTEM
M. Tope IN NRL Proc. of the 15th Ann. Precise Time and Time Interval (PTTI) Appl. and Planning Meeting 2 Apr. 1984 p 413-421 (For primary document see N85-28287 17-35)
Avail: NTIS HC A99/MF E03 CSCL 14/2

This system is designed to transfer precision time from the VAFB Master Timing System to a remote location. GRA

N85-28309# Naval Observatory, Washington, D.C.
TIMING-SYSTEM DESIGN CONSIDERATIONS FOR A MOBILE ASTROLABE
Carl F. Lukac, Paul J. Wheeler, Richard E. Keating, and Randolph T. Clarke *In* NRL Proc. of the 15th Precise Time and Time Interval (PTTI) Appl. and Planning Meeting 2 Apr. 1985 p 423-440 refs (For primary document see N85-28287 17-35)
Avail: NTIS HC A99/MF E03 CSCL 14/2

The Danjon Astrolabe at the Naval Observatory has been traditionally used to determine Universal Time and improve the systematic accuracy of star positions. During the past year, it has been used to determine latitudes and longitude at remotely scattered sites for geodetic purposes. Operating this instrument away from the Observatory necessitated a mobile support and timing system rugged enough to operate dependably in ever changing, and somtimes harsh, environmental conditions. This paper describes the performance of the astrolabe timing system, gives the basic engineering design considerations, and describes the equipment and instrumentation. Author (GRA)

N85-28310*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
PRECISE TIME TRANSFER USING MKIII VLBI TECHNOLOGY
K. J. Johnston (NRL), J. A. Buisson (NRL), M. J. Lister (NRL), O. J. Oaks (NRL), J. H. Spencer (NRL), W. B. Waltman (NRL), G. Elgered (Onsala Space Observatory), G. Lundqvist (Onsala Space Observatory), A. E. E. Rogers (Haystack Observatory), T. A. Clark et al *In* NRL Proc. of the 15th Ann. Precise Time and Time Interval (PTTI) Appl. and Planning Meeting 2 Apr. 1984 p 443-455 refs (For primary document see N85-28287 17-35)
Avail: NTIS HC A99/MF E03 CSCL 14B

It is well known that Very Long Baseline Interferometry (VLBI) is capable of precise time synchronization at subnanosecond levels. This paper deals with a demonstration of clock synchronization using the MKIII VBLI system. The results are compared with clock synchronization by traveling cesium clocks and GPS. The comparison agrees within the errors of the portable clocks (+ 5 ns) and GPS(+ or - 30 ns) systems. The MKIII technology appears to be capable of clock synchronization at subnanosecond levels and appears to be very good benchmark system against which future time synchronization systems can be evaluated. Author (GRA)

N85-28311# National Bureau of Standards, Washington, D.C. Time and Frequency Div.
CLOCK CHARACTERIZATION TUTORIAL
David W. Allan *In* NRL Proc. of the 15th Ann. Precise Time and Time Interval (PTTI) Appl. and Planning Meeting 2 Apr. 1984 p 459-75 refs (For primary document see N85-28287 17-35)
Avail: NTIS HC A99/MF E03 CSCL 14/2

Managers are often required to make key program decisions based on the performance of some elements of a large system. This paper is intended to assist the manager in this important task in so far as it relates to the proper use of precise and accurate clocks. An intuitive approach will be used to show how a clock's stability is measured, why it is measured the way it is, and why it is described the way it is. An intuitive explanation of the meaning of time domain and frequency domain measures as well as why they are used will also be given. GRA

N85-28312# Laboratoire Primaire du Temps et des Frequences, Paris (France).
METHODS FOR OPTIMAL RECURSIVE ESTIMATION OF NON-STATIONARY TIME SERIES, APPLICATIONS TO ATOMIC TIME AND FREQUENCY METROLOGY
Z. Y. Weng, J. Rutman, and J. Uebersfeld (Pierre et Marie Curie Univ.) *In* NRL Proc. of the 15th Ann. Precise Time and Time Interval (PTTI) Appl. and Planning Meeting 2 Apr. 1985 p 477-501 refs (For primary document see N85-28287 17-35)
Avail: NTIS HC A99/MF E03 CSCL 14/2

In time and frequency metrology, the problems of characterization, prediction, approximation and modelization are of fundamental importance for theoretical and experimental studies. In this paper, an improved unified approach is proposed and developed, which is based on the optimal estimation theory and the digital recursive processing methods. For two different models of non-stationary time series, the digital recursive methods of optimal estimation are presented. By these unified methods one can synthesize some digital filters and digital differentiators. These digital estimators are used to characterize the frequency instabilities of atomic clocks, to predict the random variations of atomic time scales, and to smooth the time series data. For the modelization of the statistics of frequency and phase fluctuations some analytical procedures are proposed. Then the Markov models of atomic clock instabilities can be deduced. In order to emphasize the utility of the theory, application examples are given for some time comparison data between commercial cesium atomic clocks. GRA

N85-28313# Iowa State Univ. of Science and Technology, Ames. Dept. of Electrical Engineering.
APPLIED KALMAN FILTERING: AN OVERVIEW
R. Grover Brown *In* NRL Proc. of the 15th Ann. Precise Time and Time Interval (PTTI) Appl. and Planning Meeting 2 Apr. 1985 p 503-518 refs (For primary document see N85-28287 17-35)
Avail: NTIS HC A99/MF E03 CSCL 14/2

A brief resume of the evolution of Kalman filtering from classical filter theory is presented. The required format of the discrete filter model is discussed. The recursive equations for the discrete Kalman filter are then presented, but not derived. Two scalar examples are given to illustrate the use of the recursive equations. The first deals with estimation of a random constant; the second illustrates the Wiener process. Author (GRA)

N85-28314# Defense Mapping Agency, Washington, D.C.
KALMAN FILTERING WITH A TWO-STATE CLOCK MODEL
Fran B. Varnum *In* NRL Proc. of the 15th Ann. Precise Time and Time Interval (PTTI) Appl. and Planning Meeting 2 Apr. 1985 p 519-530 refs (For primary document see N85-28287 17-35)
Avail: NTIS HC A99/MF E03 CSCL 14/2

In this paper, a formulation of the operative equations that might be employed to filter measurements taken of an atomic clock are developed in an intuitive way. Emphasis is upon making clear, in a practical example, concepts and matrix components that might otherwise appear somewhat abstract to the uninitiated in a formal derivation. Particular attention is given to the concept and calculation of the process noise required to process timing data in a Kalman filter. The author has tried to present the material in such a manner that a person with little or no experience could begin experimenting with the use of a Kalman filter to process real or simulated timing data. Author (GRA)

N85-28315# Aerospace Corp., El Segundo, Calif.
KALMAN FILTER ESTIMATES OF THE NAVSTAR SATELLITE CLOCK PARAMETERS
Paul S. Jorgensen *In* NRL Proc. of the 15th Ann. Precise Time and Time Interval (PTTI) Appl. and Planning Meeting 2 Apr. 1985 p 531-550 (For primary document see N85-28287 17-35)
Avail: NTIS HC A99/MF E03 CSCL 14/2

As is now known, the NAVSTAR/Global Positioning System is being used for precise time transfer between widely separated locations on earth. A part of this service is to provide users with information regarding the clocks in the GPS satellites. This data comes from the Kalman filter estimates in the Master Control Station at Vandenberg. This paper presents the results of an analysis of the Kalman filter data and illustrates the day-to-day characteristics of the satellite clock parameters that are provided to the time transfer user community. The monitor station tracking data also has been investigated and this paper illustrates the characteristics of the data acquired at the four monitor stations located at Vandenberg, Guam, Hawaii and Alaska. The paper shows that there are systematic and random variations in the Kalman filter estimates of the clock parameters, as well as in the tracking data. The relationship between the tracking data and the Kalman filter estimated parameters is discussed in this paper.
Author (GRA)

N85-28316# AUSTRON, Inc., Austin, Tex.
THE MEASUREMENT OF LINEAR FREQUENCY DRIFT IN OSCILLATORS
James A. Barnes *In* NRL Proc. of the 15th Ann. Precise Time and Time Interval (PTTI) Appl. and Planning Meeting 2 Apr. 1985 p 551-582 refs (For primary document see N85-28287 17-35)
Avail: NTIS HC A99/MF E03 CSCL 14/2

A linear drift in frequency is an important element in most stochastic models of oscillator performance. Quartz crystal oscillators often have drifts in excess of a part in ten to the tenth power per day. Even commercial cesium beam devices often show drifts of a few parts in ten to the thirteenth per year. There are many ways to estimate the drift rates from data samples (e.g., regress the phase on a quadratic; regress the frequency on a linear; compute the simple mean of the first difference of frequency; use Kalman filters with a drift term as one element in the state vector; and others). Although most of these estimators are unbiased, they vary in efficiency (i.e., confidence intervals). Further, the estimation of confidence intervals using the standard analysis of variance (typically associated with the specific estimating technique) can give amazingly optimistic results. The source of these problems is not an error in, say, the regressions techniques, but rather the problems arise from correlations within the residuals. That is, the oscillator model is often not consistent with constraints on the analysis technique or, in other words, some specific analysis techniques are often inappropriate for the task at hand. The appropriateness of a specific analysis technique is critically dependent on the oscillator model and can often be checked with a simple whiteness test on the residuals. GRA

N85-28317# Cobit, Inc., Industry, Calif.
A PLAN FOR THE DEVELOPMENT OF INERTIAL RECONSTRUCTION OF INITIAL STATE CLOCK (IRIS)
Ernest G. Kimme *In* NRL Proc. of the 15th Ann. Precise Time and Time Interval (PTTI) Appl. and Planning Meeting 2 Apr. 1985 p 583-616 refs (For primary document see N85-28287 17-35)
Avail: NTIS HC A99/MF E03 CSCL 14/2

Increasing utilization of wideband low energy/Hertz signalling techniques in the electronic communications and allied arts is creating an urgent need for significant improvements in the stability characteristics of small, rugged, low-cost time standards. One approch to obtaining such improvements is to apply currently available sophisticated signal processing technqiues to the homely crystal oscillator. The uncompensated crystal oscillator exhibits performance limitations due explicitly and directly to the physical and electrical characteristics of the crystal resonant element. Compensation improves the performance of the oscillator by in effect isolation of the resonator from the external environment. An alternative approach would be to attempt to create a system image of the resonator at a fixed point in time and synthesize the oscillator output from this fixed image. Kalman filtering techniques are utilized to provide initial-state estimation, and a suitable signal synthesis technique produces the time standard output signal. The crystal oscillator runs uncompensated and is merely utilized to obtain data to present to the filter on the current state of the crystal resonator. The paper includes complete generic flow charts of the proposed state estimation process and supporting signal processing. The program of development of a prototype IRIS system is described. GRA

N85-28318# Compagnie d'Electronique et de Piezo-Electricite, Argenteuil (France).
HIGH PERFORMANCES FROM A NEW DESIGN OF CRYSTAL OSCILLATOR **c33**
G. Beuvy, G. Marotel, and P. Renoult *In* NRL Proc. of the 15th Ann. Precise Time and Time Interval (PTTI) Appl. and Planning Meeting 2 Apr. 1985 p 621-634 (For primary document see N85-28287 17-35)
Avail: NTIS HC A99/MF E03 CSCL 14/2

This paper describes new designs developed and applied in order to increase the performance of crystal oscillators for military and space applications, requiring high performance. Results have been obtained from: (1) the developments of a new technology applied to crystal resonators; (2) the use of a low noise design of the electronics associated with the resonator; (3) highly miniaturized oven with PID control; and (4) assembly of these elements have met these specifications during mechanical environment tests. GRA

N85-28319# Compagnie d'Electronique et de Piezo-Electricite, Argenteuil (France).
DESIGN OF SC CUT 10 MHZ H.Q. CRYSTALS WITH G. SENSITIVITY BETTER THAN 2.10(-10)/G **c33**
A. Debaisieux, J. P. Aubry, and J. Groslambert (CNRS, Becancon, France) *In* NRL Proc. of the 15th Ann. Precise Time and Time Interval (PTTI) Appl. and Planning Meeting 2 Apr. 1985 p 635-652 refs (For primary document see N85-28287 17-35)
Avail: NTIS HC A99/MF E03 CSCL 14/2

Several theoretical and experimental studies on the force-frequency effect have shown that the g sensitivity of a crystal resonator is directly related to the location and structure of the mounting support. This work has lead to the definition of a new design of crystal resonator having low sensitivity. The effects of both surface and body forces applied to the vibrating part of the crystal must be considered. In this paper, the details of this new design are presented. Statistical results show that g sensitivity between 3 x 10 to the minus 11th power/g and 2 x 10 to the minus 10th power/g on the worst axis are currently obtained on an industrial basis. These values are measured by a 2 g tip over test in all directions either with Phase Modulated Reflectometer (which are also described at 5 and 10 MHz) or in classical oscillators. GRA

N85-28320*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
RECENT RESULTS ON THE PEFORMANCE OF EFOS, NP AND NX HYDROGEN MASERS **c36**
V. Reinhardt (Bendix Field Engineering Corp., Columbia, Md.), J. Ingold (Bendix Field Engineering Corp., Columbia, Md.), T. Stalder (Bendix Field Engineering Corp., Columbia, Md.), M. Saifi (Bendix Field Engineering Corp., Columbia, Md.), P. Dachel (Bendix Field Engineering Corp., Columbia, Md.), and S. C. Wardrip *In* NRL Proc. of the 15th Ann. Precise Time and Time Interval (PTTI) Appl. and Planning Meeting 2 Apr. 1984 p 653-676 (For primary document see N85-28287 17-35)
Avail: NTIS HC A99/MF E03 CSCL 14A

In response to a NASA Goddard Space Flight Center Work Assignment, Bendix Field Engineering Corporation evaluated the performance of the Oscilloquartz EPOS-2 hydrogen maser along with that of NASA NX-3 and NP-2 hydrogen masers in early 1983. This paper presents the results of that evaluation. GRA

N85-28321# Litton Guidance and Control Systems, Woodland Hills, Calif.
PHYSICS ELEMENT DESIGN ASPECTS FOR A TACTICAL RUBIDIUM FREQUENCY STANDARD
Bruce Grover and Tae M. Kwon *In* NRL Proc. of the 15th Ann. Precise Time and Time Interval (PTTI) Appl. and Planning Meeting 2 Apr. 1985 p 677-689 refs (For primary document see N85-28287 17-35)
Avail: NTIS HC A99/MF E03

The rubidium frequency standard to be used in tactical applications must be capable of satisfying frequency stability specifications under severe environmental conditions which include a high ambient temperature. This has resulted in a physics element design of lamp, separated filter and resonance cell which operates above the highest ambient temperature, with a simple oven structure. This design differs from previous rubidium standards primarily in its smaller size and higher operating temperatures. The Litton tactical rubidium frequency standard physics element parameters and their effects on frequency stability are presented in this paper. GRA

N85-28322# Army Electronics Technology and Devices Lab., Fort Monmouth, N. J.
CRYSTAL RESONATOR/OSCILLATOR TEST FACILITY AND TEST RESULTS
V. J. Rosati and R. L. Filler *In* NRL Proc. of the 15th Ann. Precise Time and Time Interval (PTTI) Appl. and Planning Meeting 2 Apr. 1984 p 693-705 refs (For primary document see N85-28287 17-35)
Avail: NTIS HC A99/MF E03 CSCL 14/2

The primary mission of the Frequency Control and Timing Branch of the U.S. Army Electronics Technology and Devices Laboratory is to advance the state of the art in quartz crystal resonators and oscillators in order to meet the requirements of military users. Secondary missions included consultative support to project managers and systems designers and the maintenance of the military specifications for quartz crystal resonators and crystal oscillators. In the course of fulfilling the above missions and activities, comprehensive test facilities have been established at ETDL for quartz crystal resonators and oscillators. The purpose of this paper is to outline the capabilities of the laboratory, present the results of some investigations, and offer to DOD-sponsored users our assistance with the testing, selection, specification and development, when necessary, of crystal oscillators. Author

N85-28323# Indian Space Research Organization, Ahmedabad. Space Applications Centre.
TIME SYNCHRONIZATION EXPERIMENTS WITH APPLE
C. L. Jain, K. Kumar, M. R. Sivaraman, B. S. Mathur (National Physical Lab., New Delhi, India), P. Banerjee (National Physical Lab., New Delhi, India), A. Sengupta (National Physical Lab., New Delhi, India), Mithlesh Saxana (National Physical Lab., New Delhi, India), A. K. Hanjura (National Physical Lab., New Delhi), and A. K. Suri *In* NRL Proc. of the 15th Ann. Precise Time and Time Interval (PTTI) Appl. and Planning Meeting 2 Apr. 1984 p 707-715 refs (For primary document see N85-28287 17-35)
Avail: NTIS HC A99/MF E03 CSCL 14/2

Several Time Transfer/Synchronization techniques viz transmissions of 1PPS, TV Passive, TV Active, transmission of INSAT Time Code etc. were tried out on the Indian Experimental Satellite APPLE. The availability of the APPLE Satellite for a long time gave us the opportunity to try out various new techniques which could not be tried out earlier on Symphonic and to firm up the specifications of the hardware required to be developed for various catagory of users when INSAT becomes available on an operational basis for the dissemination of Standard Time and Frequency. The drift of APPLE Satellite in its orbit was found to be about 150 meters/sec. Because of such large changes in the range of the satellite it was not possible to achieve expected accuracies in the time transfer. Due to the availability of only one transponder on board, most of the experiments were conducted in quasi-simultaneous mode. The use of 2nd order range extrapolation technique to correct for the satellite range helped us to get better time transfer accuracies than was possible with linear exprapolation. Using the techniques of 1PPS, ranging to the APPLE was carried out and orbit computation was attempted and used in a TV passive technique. In this paper results of various experiments conducted on APPLE are presented. Author (GRA)

N85-28324*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
THE SUPERCONDUCTING CAVITY STABILITY RUBY MASER OSCILLATOR
G. J. Dick (California Inst. of Technol., Pasadena) and D. M. Strayer *In* NRL Proc. of the 15th Ann. Precise Time and Time Interval (PTTI) Appl. and Planning Meeting 2 Apr. 1985 p 723-739 refs (For primary document see N85-28287 17-35)
Avail: NTIS HC A99/MF E03 CSCL 14/2

Analysis of an application of the rudy maser to a superconducting Cavity Stabilized oscillator shows many attractive features. These derive from the mechancial stability inherent in an all-cryogenic design and from the properties of the ruby maser itself. A multiple-cavity design has been developed to allow physical separation of the high-Q superconducting cavity and the ruby element with its requried applied magnetic field. Mode selection is accomplished in this design by tuning the ruby by means of the applied field. We conclude that such an oscillator would perform well, even with cavity Q's as low as 10 to the 8th power allowing the use of a superconductor-on-sapphire resonator with its greater rigidity and lower thermal expansion. A first test of the Superconducting Cavity Stabilized Maser Oscillator (SCSMO) confirms the efficacy of the multiple-cavity design and the applicability of the ruby maser. Frequency variation less than 4x10 to the minus 11th power was measured in the stabilized mode and is attributed to the reference oscillator and to instabilities in the pump source. Variation of 10 to the minus 10th power was observed in the low-Q unstabilized mode, again attributable to pump fluctuations. Even so, direct scaling to a Q of 10 the 9th power predicts a stability better than 10 to the minus 15th power. Together with results showing the lowest losses to date in sapphire at microwave frequencies, and preliminary experiments on superconductor-on-sapphire resonators, frequency stability, levels as low as 10 to the minus 17th power are indicated. GRA

N85-28325# Naval Weapons Center, China Lake, Calif.
VOLTAMMETRIC ANALYSIS OF ORDNANCE MATERIALS. PART 2: A PORTABLE DIGITAL VOLTAMMETER FOR USE WITH A SILVER WIRE WORKING ELECTRODE Final Report, Feb. 1980 - Feb. 1984
D. A. Fine, D. A. Reeve, and R. A. Dickus Dec. 1984 57 p (F55-59)
(AD-A152480; AD-E900442; NWC-TP-6577) Avail: NTIS HC A04/MF A01 CSCL 07/4

An inexpensive, portable, digital voltammeter has been designed and built at NWC. The instrument is intended for use with a silver wire working electrode. The voltammeter was built in response to a need on the part of Navy facilities for the monitoring of effluent water from the carbon column cleanup process used to remove propyleneglycoldinitrate from Otto fuel waste water. The instrument may also be used for the monitoring of contaminants such as nitroglycerin, dinitrotoluene, trinitrotoluene and nitroguanidine. This report describes in detail the construction, circuitry, software and operational features of the instrument. GRA

N85-28326# Royal Aircraft Establishment, Farnborough (England).
A TEN CHANNEL TEMPERATURE CONTROLLER
D. H. Lister May 1984 48 p
(AD-A152664; RAE-TM-P-1026; BR93236) Avail: NTIS HC A03/MF A01 CSCL 14/2

A modular ten channel temperature controller has been designed for use with modestly rated loads. Versions using thermocouple and platinum resistance thermometer temperature sensors have been built and their performance characteristics determined. An option for driving higher power loads is also available. Author (GRA)

N85-28327# Dayton Univ., Ohio. Research Inst.
DOCUMENTATION OF PHOTO: A USER'S MANUAL FOR THE ANALYSIS OF PHOTOGRAPHIC AND X-RAY NEGATIVES Interim Report, Jun. 1983 - Sep. 1984
D. P. Anderson Wright-Patterson AFB, Ohio AFWAL Feb. 1985 34 p
(Contract F33615-82-C-5001)
(AD-A152988; AFWAL-TR-84-4159) Avail: NTIS HC A03/MF A01 CSCL 14/5

This report describes the operation of the currently used, FORTRAN-4, X-ray photographic analysis program, PHOTO. The previous reports were issued by the original programmer of the software and were designed for general use. This manual describes the use of a specifically modified version of AFWAL/MLBP. The procedures and examples given here are typical of the type used by this group. The program assumes that the optical densities (ranging from 0 to 3) from the negative have been digitized as eight bit binary integers. The pixel size is assumed to be 0.1 mm x 0.1 mm. GRA

N85-28328# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
HEATING PARAMETER ESTIMATION USING COAXIAL THERMOCOUPLE GAGES IN WIND TUNNEL TEST ARTICLES M.S. Thesis
N. T. Cahoon Dec. 1984 132 p
(AD-A153039; AFIT/GAE/AA/84D-3) Avail: NTIS HC A07/MF A01 CSCL 09/2

A heat energy balance is applied to a coaxial thermocouple gage for parameter estimation in wind tunnel test articles. This method can significantly reduce wind tunnel test costs and time. Modifications to the data reduction program HEATEST (HEATing ESTimation) are made. The programs allows for transient test techniques to be used as well as assuming an isothermal wall. A non-linear convective heat transfer coefficient model may also be used. Data is generated to test the new program. Temperature profiles throughout the thermocouple gage were good and were compared with changes in time step, thermocouple length, and number of discrete node points. The estimation of the convective heat transfer coefficient and thermal conductivity were excellent. GRA

N85-28329# Nichols Research Corp., Ann Arbor, Mich.
ANALYSIS AND MODELING FOR THERMAL FOCAL PLANE ARRAYS Final Report
T. W. Tuer, B. W. Ball, J. R. Freeling, J. W. Lennington, and G. H. Lindquist 10 Jul. 1984 116 p
(Contract DAAK70-83-C-0026)
(AD-A153156; NRCAA-TR-84-001) Avail: NTIS HC A06/MF A01 CSCL 14/2

The development of a first principles computer simulation of a generic pyroelectric thermal detector is described. Formulation of the pertinent equations (based on a thorough literature survey) is presented. This simulation incorporates a finite difference treatment of the transient three-dimensional thermal response of composite focal plane arrays, with treatments of the signal generation, readout and processing including all pertinent noise sources. A number of simplified problems having analytical solutions were treated to validate various portions of the simulation to within a few percent. Performance estimates were made for conceptual several configurations and materials. GRA

N85-28330# JAYCOR, Alexandria, Va.
DESIGN AND TESTING OF A HIGH POWER QUASI-OPTICAL GYROTRON Final Report, 1 Oct. 1983 - 31 Oct. 1984
T. A. Hargreaves 25 Mar. 1985 78 p
(Contract N00014-84-C-2014)
(AD-A153212; JAYCOR-J206-85-001/6242) Avail: NTIS HC A05/MF A01 CSCL 09/1

There are two major foci of this work; the development of a 100-120 GHz quasi-optical gyrotron and the realization of a 4 MW electron gun. The report is divided naturally into five sections, the first of which deals with the design of a quasi-optical gyrotron. The second section details the results of experiments performed with a single mode cavity. This is followed by a section describing the computational work done modelling the mirror cavity of the quasi-optical gyrotron. The design and initial results of a multi-mode quasi-optical cavity are discussed in the fourth section. Included in this section is a description of the design for a MW experiment. The final section describes the work done on the Department of Defense 4 MW electron gun. GRA

N85-28331# North Carolina Central Univ., Durham. Dept. of Physics.
HIGH PRECISION MATERIALS CHARACTERIZATION IN THE NEAR MILLIMETER WAVE-LENGTH RANGE Final Report, 1 Oct. 1983 - 30 Sep. 1984
J. M. Dutta and C. R. Jones 7 Feb. 1985 13 p
(Grant DAAG29-83-G-0113)
(AD-A153267; ARO-21126.1-PH-H) Avail: NTIS HC A02/MF A01 CSCL 14/2

A double-beam instrument developed in this laboratory has been used to measure the complex indices of refraction of various material at 245 GHz. We report here the results for crystal quartz, water free fused quartz (Spectrasil WF), silicon, beryllia, boron nitride (grade HP), and a nickel ferrite (Trans-Tech 2-111). We compare our results with the results obtained by other researchers using different techniques as available. GRA

N85-28332# Houston Univ., Tex.
AN ULTRASENSITIVE AND ELEMENT SPECIFIC PHOTOIONIZATION DETECTION SYSTEM FOR ENVIRONMENTAL ANALYSIS Final Report, 18 Jan. 1982 - 17 Jan. 1985
A. Zlatkis Mar. 1985 7 p
(Contract DAAG29-82-K-0054)
(AD-A153365; ARO-18522.7-CH) Avail: NTIS HC A02/MF A01 CSCL 07/4

The problem of trace analysis at the parts per trillion level in environmental samples has been a challenging one for analytical chemists during the past two decades. The presence of substances in very low concentrations in a complex matrix demands the development of both selective and sensitive detectors for their determination by gas chromatography. The photoionization detector (PID) now commercially available is capable of providing the very high sensitivity desired for trace level analysis. Indeed its low volume ionization chamber make it suitable for use with capillary columns. The PID also lends itself to the development of an element selective detector. This could be expected by catalytic conversion of the effluent to H2S, PH3, and NH3. Scrubbers to remove unwanted gases could yield e.g., PH3 only thereby making the detector P selective. Sensitivities at the pg level could be possible. GRA

N85-28333# Department of the Air Force, Washington, D.C.
PRINTED WIRING BOARD CIRCUIT ISOLATOR TOOL Patent Application
R. D. Huxsol, inventor (to Air Force) Filed 6 Feb. 1985 8 p
(AD-D011638; US-Patent-Appl-SN-698726) Avail: NTIS HC A02/MF A01 CSCL 14/2

A tool for isolating a printed circuit wiring trace from a component pin, said tool having a rotatable shank with an internal cavity and external cutting flutes formed on an end thereof. The end of the tool is pushed over the exposed end of the pin such that the cutting flutes bear against the solder material which bridges the gap between the printed wiring trace and the component pin. The tool is then rotated to remove the solder bridge and any underlying wiring trace material to isolate the wiring trace and pin from each other. GRA

N85-28334# California Univ., Livermore. Lawrence Livermore Lab. Laser Program.
SUB-NANOSECOND CINEMATOGRAPHY IN LASER FUSION RESEARCH: CURRENT TECHNIQUES AND APPLICATIONS AT THE LAWRENCE LIVERMORE LABORATORY
L. W. Coleman 10 Jan. 1985 9 p refs Presented at the 16th Intern. Congr. on High Speed Photography and Photonics,

Strasbourg, France, 27-31 Aug. 1984
(Contract W-7405-eng-48)
(DE85-007252; UCRL-90750; CONF-840887-13) Avail: NTIS HC A02/MF A01

Progress in laser fusion research has increased the need for detail and precision in the diagnosis of experiments. This has spawned the development and use of sophisticated sub-nanosecond resolution diagnostic systems. These systems typically use ultrafast X-ray or optical streak cameras in combination with spatially imaging or spectrally dispersing elements. These instruments provide high resolution data essential for understanding the processes occurring in the interaction of high intensity laser light with targets. Several of these types of instruments and their capabilities will be discussed. The utilization of these kinds of diagnostics systems on the nearly completed 100 kJ Nova laser facility will be described. DOE

N85-28335# Oak Ridge National Lab., Tenn. Plant and Equipment Div.
SCANNING ELECTRON MICROSCOPE FACILITY FOR EXAMINATION OF RADIOACTIVE MATERIALS
J. R. Gibson and D. N. Braski Feb. 1985 24 p refs
(Contract DE-AC05-85OR-21400)
(DE85-008127; ORNL/TM-9451) Avail: NTIS HC A02/MF A01

An AMRAY model 1200B scanning electron microscope was modified to permit remote examination of radioactive specimens. Features of the modification include pneumatic vibration isolation of the column, motorized stage controls, improvements for monitoring vacuum, and a system for changing filaments without entering the hot cell. DOE

N85-28336# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Brunswick (West Germany). Abt. Kreiselgeraete und Traegheitsnavigation.
MEASUREMENTS OF LASER GYRO ERRORS AS A FUNCTION OF THE BEAM PATH
Ruediger Rodloff, Wolfgang Burchardt, and Werner Jungbluth Nov. 1984 44 p refs In GERMAN; ENGLISH summary Report will be announced as translation ESA-TT-922
(DFVLR-FB-85-02; ISSN-0171-1342) Avail: NTIS HC A03/MF A01; DFVLR, Cologne DM 16.50

A ring laser system with adjustable beam path was tested. The characteristics of the ring laser used as a laser gyro are influenced by the beam geometry. The lock-in threshold, the scale factor and the gyro drift are influenced by the mirror backscattering, the gas discharge parameters, the resonator losses, and by the beam path position within the resonator. Author (ESA)

N85-28337# Siemens A.G., Munich (West Germany). Werk Halbleiter.
HIGH TEMPERATURE POSITION SENSORS BASED ON MONOLITHIC GaAs HALL IC Final Report, Mar. 1984
Ewald Pettenpaul, Wolfgang Heidenreich, and Jakob Huber Bonn Bundesministerium fuer Forschung und Technologie Dec. 1984 46 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-84-266; ISSN-0340-7608) Avail: NTIS HC A03/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 9.50

A x-plast package procedure for cheap line assembly of high temperature position sensors based on a monolithic GaAs Hall IC was developed. The three stage IC contains a Hall device with constant current source, a dual gate MESFET differential amplifier, and a source follower. The differential amplifier delivers a low frequency gain of 100 to 150, a sensitivity of the Hall IC of 180 V/T with supply voltage of 8 to 15 V and works up to 180 C. The DIOM technique meets the reliability requirement of the sensor and the gain and uniformity demands of the GaAs differential amplifier. The planar technique includes localized ion implantation and self aligned gate definition. Author (ESA)

N85-28338# Endress und Hauser G.m.b.H. und Co., Maulburg (West Germany). Bereich Forschung und Entwicklung.
TECHNOLOGY DEVELOPMENT FOR THIN-FILM-TRACE HUMIDITY SENSORS Final Report, Mar. 1983
Wolfgang Woest, Rainer Silbermann, Frank Hegner, and Rainer Hermann Bonn Bundesministerium fuer Forschung und Technologie Dec. 1984 60 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-84-268; ISSN-0340-7608) Avail: NTIS HC A04/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 12.50

Aluminum oxide trace humidity sensors in thin film technology were optimized with respect to response time and long term stability. The influence of the aluminum dioxide process parameters on sensor characteristics was investigated. A substrate with protected fedd throughs qualified for industrial purposes is developed. For additional improvement of the sensor characteristics, a barrier layer for solid state diffusion consisting of titanium-nitride is deposited between the electrical contact and the aluminum thin film. Author (ESA)

N85-27969*# Sverdrup Technology, Inc., Middleburg Heights, Ohio.
OPTICAL STRAIN MEASUREMENT SYSTEM DEVELOPMENT Abstract Only
Christian T. Lant *In* NASA. Lewis Research Center Struct. Integrity and Durability of Reusable Space Propulsion Systems May 1985 p 189-193 ref (For primary document see N85-27941 17-20)
Avail: NTIS HC A09/MF A01 CSCL 14B

N85-28152# Joint Publications Research Service, Arlington, Va.
HOLOGRAPHIC INTENSITY CORRELATOR WITH PRIS-TYPE PHOTOELECTRO-OPTICAL CONTROLLED TRANSPARENCY
A. N. Oparin, O. I. Potaturkin, V. I. Feldbush, and P. M. Shipov *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-85-004) 15 May 1985 p 49-54 refs Transl. into ENGLISH from Avtometriya (Novosibirsk), v. 3, May-Jun. 1984 p 57-61 (For primary document see N85-28142 17-31)
Avail: NTIS HC A06/MF A01

N85-28153# Joint Publications Research Service, Arlington, Va.
HOLOGRAPHIC CORRECTOR IN OBJECTIVE WITH COMPOUND MAIN MIRROR Abstract Only
Yu. D. Pimenov, Yu. Ye. Kuzilin, V. N. Sintsov, and N. A. Sitnik *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-85-004) 15 May 1985 p 78 Transl. into ENGLISH from Optiko-Mekhan. Prom. (Leningrad), no. 7, Jul. 1984 p 23-26 (For primary document see N85-28142 17-31)
Avail: NTIS HC A06/MF A01

N85-28171# Joint Publications Research Service, Arlington, Va.
NMR MANOMETER FOR MEASURING HIGH PRESSURES AT LIQUID-HELIUM TEMPERATURES Abstract Only
V. D. Doroshev, N. M. Kovtun, A. N. Molchanov, P. I. Polyakov, and V. G. Synkov *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-85-004) 15 May 1985 p 94 Transl. into ENGLISH from Pribory i Tekhn. Eksperim. (Moscow), no. 4, Jul. - Aug. 1984 p 195-199 (For primary document see N85-28142 17-31)
Avail: NTIS HC A06/MF A01

N85-28172# Joint Publications Research Service, Arlington, Va.
PRINCIPLES OF DESIGNING DIGITAL COMPENSATING ACCELEROMETERS Abstract Only
A. I. Skalon *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-85-004) 15 May 1985 p 95-96 Transl. into ENGLISH from Izmereniya, Kontrol, Avtomatia. (Moscow), no. 1(49), 1984 p 43-50 (For primary document see N85-28142 17-31)
Avail: NTIS HC A06/MF A01

N85-28173# Joint Publications Research Service, Arlington, Va.
UNIAXIAL ANGULAR ACCELEROMETERS Abstract Only
A. V. Seleznev and I. A. Shvab *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-85-004) 15 May 1985 p 96 Transl. into ENGLISH from Izmereniya, Kontrol, Avtomatiz. (Moscow), no. 1(49),

1984 p 32-42 (For primary document see N85-28142 17-31)
Avail: NTIS HC A06/MF A01

N85-28175# Joint Publications Research Service, Arlington, Va.
APPARATUS FOR MEASURING VELOCITY OF SOUND IN FLUIDS Abstract Only
D. L. Timrot, M. A. Serednitskaya, and T. D. Chkhikvadze *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-85-004) 15 May 1985 p 98 Transl. into ENGLISH from Toplofiz. Vysokikh Temp. (Moscow), v. 22, no. 3, May - Jun. 1984 p 569-573 (For primary document see N85-28142 17-31)
Avail: NTIS HC A06/MF A01

N85-28176# Joint Publications Research Service, Arlington, Va.
LIQUID-METAL TRANSDUCERS FOR STRAIN MEASUREMENT DURING IN-PILE MATERIALS TESTING Abstract Only
V. A. Neverov and Yu. L. Revyakin *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-85-004) 15 May 1985 p 98-99 Transl. into ENGLISH from Atomnaya Energ. (Moscow), v. 57, no. 5, Nov. 1984 p 349-353 (For primary document see N85-28142 17-31)
Avail: NTIS HC A06/MF A01

36 LASERS AND MASERS

Includes parametric amplifiers.

N85-28339 Department of the Air Force, Washington, D.C.
JINC-TRAP RESONATOR Patent
T. R. OMeara, inventor (to Air Force) Issued 5 Feb. 1985 6 p Supersedes AD-D010267
(AD-D011650; US-Patent-4,498,184; US-Patent-Appl-SN-484327; US-Patent-Class-372-92) Avail: US Patent and Trademark Office CSCL 20/5

A Jinc-trap resonator has a Fourier transform resonator structure with a Jinc-trap spatial filter disposed in one of two opposite end transform planes. A near Jinc-like mode is effectively trapped at the one plane where the filter is located, while a corresponding transform mode that is nearly constant in amplitude and flat in phase is located at the opposite transform plane. The Jinc-trap spatial filter is composed of a first series of concentric absorption bands and a second series of concentric reflecting bands which alternate in position with the absorption bands. GRA

N85-28340# Naval Postgraduate School, Monterey, Calif.
DESIGN AND CONSTRUCTION OF A CW ND:YAG LASER USING A SINGLE ELLIPTICAL CAVITY AND WATER COOLED KRYPTON ARC LAMP PUMPING M.S. Thesis
B. T. Burkett Dec. 1984 72 p
(AD-A152657) Avail: NTIS HC A04/MF A01 CSCL 20/5

A continuous wave neodymium:YAG laser was designed and constructed using a water cooled krypton arc lamp as the pump source in a single elliptical cavity. Operational testing of the system could not be done due to technical problems with running the arc, but fluorescence measurements on the cavity were made using a tungsten filament lamp. The results were compared with those of previous projects which employed circular cylindrical cavities. The elliptical cavity did not have the highly reflective gold coating present on the other cavities, and was not designed for the tungsten lamp. Despite this, the elliptic cavity's fluorescence output was greater than that recorded for the multi-lamp configurations at the same time input power levels. A detailed description of the design process used and sufficient information to implement recommendations and improve the overall system are given this thesis. Author (GRA)

N85-28341# Naval Postgraduate School, Monterey, Calif.
OPERATING CHARACTERISTICS, ABSORPTIVITY/REFLECTIVITY MEASUREMENTS, AND PULSE SYSTEM DESIGN OF THE NPS (NAVAL POSTGRADUATE SCHOOL) HYDROGEN FLUORIDE/DEUTERIUM FLUORIDE LASER M.S. Thesis
E. L. Garcia Dec. 1984 60 p
(AD-A152712) Avail: NTIS HC A04/MF A01 CSCL 20/5

The Hydrogen Fluoride/Deterium Fluoride Laser is a fast flow electrical discharge operated chemical laser. Refitting of the subsystems of the laser was completed and lasing was observed utilizing a 100 percent reflectance mirror and a 95 percent reflectance output coupling mirror. The maximum multiline output power obtained was 2.6 Watts at 19.0 kV and 475 mA. The data obtained was in general agreement with previously reported data. However, an increase in power output from 1.6 to 2.6 Watts was obtained by utilization of a Hipotronics power supply that enabled usage of higher output voltages for SF6 dissociation. Measurements were also taken over a variation of the He, SF6, H2 and O2 flow rates resulting in the change of optimum flow rates for the above listed gases. Target reflectivity/absorptivity measurements were taken and a dependence on incidence angle with the laser beam was found. For the P-doped Silicon wafer used, the power absorbed decreased over the range of 25 to 60 degrees. At the 25 degree angle approximately 95 percent of the incident power was absorbed. The reflected power was found to increase with the increase in target angle with approximately 95 percent of the incident power being reflected at 60 degrees. GRA

N85-28342# Hughes Research Labs., Malibu, Calif.
LOW VOLTAGE FREE ELECTRON LASER DEVELOPMENT Final Report, 1 Feb. 1982 - 31 Oct. 1984
R. J. Harvey and F. A. Dolezal Feb. 1985 56 p refs
(Contract N00014-82-C-0220)
(AD-A152917) Avail: NTIS HC A04/MF A01 CSCL 20/5

The two-beam, two-stage Free Electron Laser (FEL)1 offers the possibility of a compact, low voltage FEL (LVFEL). This LVFEL development program has addressed the issues of the first stage of such a LVFEL. During the course of this program we have demonstrated the first plane-polarized mm-wave FEL oscillator. The FEL operates at 31 Ghz with an output power of 60 kW. We have observed radiation on the forward and backward-wave portions of the dispersion curve. The gain of the device has been estimated, from the signal buildup time, to be approximately 5% for both forward and backward-wave operation. The line width of this device has been measured in the forward-wave mode to be 11.7% in voltage space and $< 4.8\%$ in frequency space. These line widths correspond well to theoretically predicted values of 3.1 and 3.7%, respectively. The polarization of the device has been measured to be roughly perpendicular to the direction of the wiggler field. GRA

N85-28343# Arizona Univ., Tucson. Dept. of Chemistry.
CONSTRUCTION TECHNIQUES OF A MOLECULAR HYDROGEN LASER Interim Technical Report
Jeffery S. Babis (Beckman Instruments, Irvine, Calif.), Thomas C. Huth, and M. Bonner Denton 20 Mar. 1985 12 p Submitted for publication
(Contract N00014-83-K-0268)
(AD-A152928; TR-38) Avail: NTIS HC A02/MF A01 CSCL 20/5

Simple techniques are described for construction of a discharge channel, and spark gap trigger electrode for a travelling-wave excited molecular hydrogen laser. GRA

N85-28344# Rochester Univ., N. Y. Dept. of Chemistry.
THEORY OF LASER-STIMULATED SURFACE PROCESS. 2: A GENERALIZED-MASTER-EQUATION APPROACH TO ENERGY TRANSFER BETWEEN AN IR LASER, AN ASPECTIES AND PHONONS Interim Technical Report
A. C. Beri and T. F. George Apr. 1985 44 p
(Contract N00014-80-C-0472)
(AD-A153083; UROCHESTER/DC/82/TR-60) Avail: NTIS HC A03/MF A01 CSCL 20/5

The time evolution of the vibrational states of an adspecies-surface bone (adbond) excited by IR laser radiation and coupled to phonon modes of the solid is obtained by numerical solution of a generalized master equation. For three levels of a system composed of an atom adsorbed at the end of linear chain, the average adbond energy is seen to have a monotonic and oscillatory

component. Under certain resonance conditions, energy is continuously adsorbed by the adbond from both the laser and the phonons. The Markovian approximation is shown to be inappropriate for this case, and a measure of non-Markovian behavior is proposed. Feedback and synergistic effects are discussed. GRA

N85-28345# Southern Methodist Univ., Dallas, Tex.
INJECTION LASER STRUCTURE DESIGN Final Report, 1 May 1980 - 31 Aug. 1984
J. K. Butler 30 Jan. 1985 81 p
(Contract DAAG29-80-K-0004)
(AD-A153210; ARO-16436.7-EL) Avail: NTIS HC A05/MF A01 CSCL 20/5

Injection lasers have potential for replacing many of the high-power conventional gas lasers. The research performed in this project was aimed at the design of high-power semiconductor lasers for communications, printing, and others. Diode lasers have been analyzed for obtaining high output power at single frequencies and for optical pattern stability. We have analyzed the following laser types: (1) Gain guided, (2) Index guided, and (3) W-Guides. GRA

N85-28346# Drexel Univ., Philadelphia, Pa.
INSTABILITIES AND CHAOTIC BEHAVIOR OF ACTIVE AND PASSIVE LASER SYSTEMS Final Report, 1 Dec. 1981 - 6 Dec. 1984
L. M. Narducci Mar. 1985 46 p
(Contract DAAG29-82-K-0021)
(AD-A153366; ARO-18578.19-PH) Avail: NTIS HC A03/MF A01 CSCL 20/5

The main thrust has been to investigate the occurrence of unstable behaviors in active and passive quantum optical systems. Considerable theoretical progress has been made with optical bistability to the point that no additional efforts appear to be needed on this front. Research is still very active, instead, to understand the origin of pulsations and chaos in lasers with an injected signal, laser systems with a nonuniform transverse intensity profile, and inhomogeneously broadened high-gain lasers. GRA

N85-28347# Los Alamos Scientific Lab., N. Mex.
RESONATOR OPTICAL DESIGNS FOR FREE ELECTRON LASERS
V. K. Viswanathan, A. Saxman, and G. Woodfin 1985 6 p refs Presented at the Southwest Conf. on Optics, Albuquerque, N. Mex., 4-8 Mar. 1985
(Contract W-7405-eng-36)
(DE85-007678; LA-UR-85-674; CONF-850345-2) Avail: NTIS HC A02/MF A01

The output beam from free-electron lasers tends to be a thin, pencil-like beam because of the nature of the gain volume. For moderate power devices, mirror damage considerations imply that the beam has to travel many meters before it can expand enough to allow retro-reflection from state-of-the-art mirrors. However, use of grazing incidence optics can resolve the problem of damage to the optical elements and result in a cavity of reasonable dimensions. The optical design considerations for such resonators are discussed. A few of the practical resonator designs approaching diffraction limited performance are presented. DOE

N85-28348# Brookhaven National Lab., Upton, N. Y.
LASER PLASMA LINAC
R. B. Palmer, N. Baggett, J. Claus, R. Fernow, A. Ghosh, S. Giordano, V. Radeka, I. Stumer, P. Takacs, and J. Warren 1984 8 p refs Presented at the CAS-EFCA-INFN Workshop on the Generation of High Fields for Particle Acceleration to Very High Energies, Frascat, Italy, 25 Sep. 1984
(Contract DE-AC02-76CH-00016)
(DE85-008294; BNL-35737; CONF-840957-1) Avail: NTIS HC A02/MF A01

The grating accelerator concept is reviewed. The use of a double row of conducting droplets instead of a conventional grating constrains the fields to a narrow band. The use of droplets also allows fields that will destroy the structure. The RF modeling results are presented together with a simple theory of the fields. Coupling to incoming radiation is described. A possible laser specification is also given. DOE

N85-28349# California Univ., Livermore. Lawrence Livermore Lab.
SUPPORT STRUCTURES FOR OPTICAL COMPONENTS IN THE LASER DEMONSTRATION FACILITY
R. G. Finucane 25 Jan. 1985 23 p refs Prepared in cooperation with Martin Marietta Energy Systems
(Contract W-7405-eng-48)
(DE85-008879; UCID-20323) Avail: NTIS HC A02/MF A01

The laser system in the Laser Demonstration Facility is mounted on an array of 108 support columns. This milestone report describes the design, analyses, testing, fabrication, installation, and performance characteristics of these supports. The supports were judged to be an effective and economical approach to mounting a large scale laser system. DOE

N85-28350# Sandia Labs., Albuquerque, N. Mex.
LASER MEASUREMENT TECHNIQUES: LASER SPECTROSCOPY IN SEMICONDUCTORS
E. D. Jones and G. L. Wickstrom 1985 6 p refs Presented at the Southwest Conf. on Optics, Albuquerque, N. Mex., 4 Mar. 1985
(Contract DE-AC04-76DP-00789)
(DE85-007887; SAND-84-2080C; CONF-850345-3) Avail: NTIS HC A02/MF A01

A CAMAC-based digital data acquisition system to study luminescence spectra and dynamics in semiconductors using pulsed and CW laser sources is described. Various experimental techniques for measuring time-dependent luminescence and laser excitation spectra are discussed. In order to demonstrate the system performance and sensitivity of this data acquisition system, experimental low-temperature laser-induced luminescence data for the oxygen-bound exciton in the 2-6 semiconductor compound ZnTe is presented. DOE

N85-28351# Pacific Northwest Lab., Richland, Wash.
RAMAN STUDIES OF LASER DAMAGED SINGLE AND MULTILAYER OPTICAL COATINGS
G. J. Exarhos and P. I. Morse (Air Force Weapons Lab., Kirtland AFB, N. Mex.) Feb. 1985 23 p refs Presented at the Southwest Conf. on Optics, Albuquerque, N. Mex., 4 Mar. 1985
(Contract DE-AC06-76RL-01830)
(DE85-009431; PNL-SA-12997; CONF-850345-8) Avail: NTIS HC A02/MF A01

Structural changes in dielectric optical coatings induced thermally or by high energy pulsed laser irradiation were studied by the nondestructive technique of Raman Spectroscopy. A two laser (damage, probe) arrangement was used to characterize the damage process in crystalline and amorphous TiO2 and ZrO2 coatings on silica during irradiation and at longer times following the onset of damage. Raman measurements were also undertaken to assess the effects of coating phase and microcrystalline grain orientation on laser induced damage in TiO2. Results suggest that certain phases have higher damage thresholds for comparable coating thicknesses and that thermal and electronic excitation effects are important considerations for modeling the damage process. DOE

N85-28352# Oak Ridge National Lab., Tenn.
LASER MEASUREMENTS OF DISTANCES FROM THE ORELA NEUTRON TARGET TO EXPERIMENT STATIONS ALONG FLIGHT PATHS 1 AND 6
D. C. Larson, N. M. Larson, J. A. Harvey, F. G. Perey, D. E. Pierce, and R. H. Seals Mar. 1985 38 p refs
(Contract DE-AC05-84OR-21400)
(DE85-009457; ORNL/TM-9097) Avail: NTIS HC A03/MF A01

Flight path lengths were measured by laser techniques for the 200, 80, and 18 m stations along flight path 1, and for the 5, 20, 40, and 150 m stations along flight path 6 at the Oak Ridge Electron Linear Accelerator (ORELA). In each case the distance

evaluated from the measurements is the slope distance from the center of the neutron producing target to a position along the beam path, directly above a suitable benchmark at the experiment station. A total of 25 laser measurements were performed between the various stations. These data, along with appropriate uncertainties, were combined using Bayes' method. From this analysis was obtained the desired flight path lengths, which typically have uncertainties less than 1.5 mm. The measurement technique, uncertainties, analysis method, and results are documented in detail in this report. DOE

N85-28174# Joint Publications Research Service, Arlington, Va.
TECHNOLOGICAL APPARATUS FOR LASER TREATMENT OF MATERIALS Abstract Only
A. V. Kirillin, A. V. Kostanovskiy, and V. L. Vinogradov *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-85-004) 15 May 1985 p 97 Transl. into ENGLISH from Teplofiz. Vysokikh Temp. (Moscow), v. 22, no. 6, May - Jun. 1984 p 1200-1205 (For primary document see N85-28142 17-31)
Avail: NTIS HC A06/MF A01

N85-28320*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
RECENT RESULTS ON THE PEFORMANCE OF EFOS, NP AND NX HYDROGEN MASERS
V. Reinhardt (Bendix Field Engineering Corp., Columbia, Md.), J. Ingold (Bendix Field Engineering Corp., Columbia, Md.), T. Stalder (Bendix Field Engineering Corp., Columbia, Md.), M. Saifi (Bendix Field Engineering Corp., Columbia, Md.), P. Dachel (Bendix Field Engineering Corp., Columbia, Md.), and S. C. Wardrip *In* NRL Proc. of the 15th Ann. Precise Time and Time Interval (PTTI) Appl. and Planning Meeting 2 Apr. 1984 p 653-676 (For primary document see N85-28287 17-35)
Avail: NTIS HC A99/MF E03 CSCL 14A

37 MECHANICAL ENGINEERING

Includes auxiliary systems (non-power); machine elements and processes; and mechanical equipment.

N85-28353 Metals Society, London (England).
WELDING OF 11 458.1 STEEL IN SHIELDING ATMOSPHERES
J. Novotny Nov. 1984 20 p refs Transl. into ENGLISH from Zvaranie (Czechoslovakia), no. 7, 1982 p 218-222
(BLL-BISI-Trans-21763-(9022.06)) Avail: British Library Lending Div., Boston Spa, Engl.: UK £14.25; Overseas $33.75

The mechanical properties of welded joints in 458.1 steel produced under a shielding atmosphere of either CO2 or 80% argon plus 20% CO2 are discussed. Joints were examined after stress relieving. A filler material is recommended. R.J.F.

N85-28354 Metals Society, London (England).
LOCAL HEAT TREATMENT OF WELDED JOINTS OF PIPES AND ROTARY VESSELS
B. Kolodej Jan. 1985 14 p refs Transl. into ENGLISH from Zvaranie (Czechoslovakia), no. 10, 1981 p 309-313
(BLL-BISI-Trans-22197-(9022.06)) Avail: British Library Lending Div., Boston Spa, Engl.: UK £20.50; Overseas $45.00

The effect of the basic parameters of heating on the lowering of residual stresses in pipe welds was studied. Comparison of Czeck. and foreign standards and specifications was undertaken. Necessity of revision of the former is emphasized. Author

N85-28355 Metals Society, London (England).
DETERMINATION OF WEAR INTENSITY AND RESOURCE OF CRANKSHAFTS AND CYLINDER LINERS OF ZIL-130 AND ZMZ-53 ENGINES
S. Kerekov 3 Jan. 1985 12 p refs Transl. into ENGLISH from Mashinostr. (Bulgaria), no. 4, 1982 p 172-175
(BLL-BISI-Trans-21393-(9022.06)) Avail: British Library Lending Div., Boston Spa, Engl.

Methods for determining the characteristics of wear and supplies of the crankshafts and cylinder sleeves of ZIL-130 and ZMZ-53 engines are covered. These components limit the engine's durability and that is why they are considered to be the most important. Engine components wear resistance is numerically analyzed. Analysis of the results obtained from processing the statistical data showed that engines are taken for overhaul when their basic component process stock of exploitation resource. In order to use the exploitation resource of the engine it is reasonable to introduce the term average repair for automobiles. E.R.

N85-28356 Metals Society, London (England).
SUBMERGED ARC WELDING OF NEW CZECHOSLOVAK MICRO-ALLOY STEELS
E. Malinovska 3 Jan. 1984 21 p refs Transl. into ENGLISH from Zvaranie (Czechoslovakia), no. 8, 1981 p 228-234
(BLL-BISI-Trans-22193-(9022.06)) Avail: British Library Lending Div., Boston Spa, Engl.

Problems of submerged arc welding of microalloy steels were studied. Welding conditions and consumables for Nb and NbV microalloy steels were selected. Microalloy steels belong to the structural steels with a higher yield point and better service properties. The steels are chosen for fabrication of welded structures and pressure vessels. Their weldability and finding a suitable welding technology is studied. E.A.K.

N85-28357 Metals Society, London (England).
STUDY OF A SIMULATED TEST FOR ASSESSING THE MACHINABILITY OF STEELS
A. Bruno et al 15 Mar. 1984 23 p refs Transl. into ENGLISH from Met. Ital. (Italy), no. 6, 1983 p 424-431
(BLL-BISI-Trans-22344-(9022.06)) Avail: British Library Lending Div., Boston Spa, Engl.

A test was developed for assessing the machinability of steels by simulating form turning. Performed with H.S. tools, it was used for: 20NiCrMo2 standard and calcium; 18CrMo4 standard and leaded. A 'finishability' test was developed for qualitative appraisal from the standpoint of surface roughness attainable. R.J.F.

N85-28358 Metals Society, London (England).
APPLICATION OF 4-WIRE SUBMERGED ARC METHOD TO WELDING UOE PIPE
F. Kawabata et al 29 Mar. 1984 14 p refs Transl. into ENGLISH from Kawasaki Steel Giho (Japan), v. 14, no. 4, 1982 p 436-443
(BLL-BISI-Trans-22417-(9022.06)) Avail: British Library Lending Div., Boston Spa, Engl.

The processes used in manufacturing UOE steel pipes of large diameter are shape forming, welding, rectification and inspection etc., of which the welding process, which controls the productivity of the line, the quality of the products or a yield (of the steel) is very important. This article reports the results of studies of the process culminating in the actual application of 4-wire welding, and the results achieved. B.W.

N85-28359 Metals Society, London (England).
STUDY OF A TEST METHOD FOR ASSESSING MACHINABILITY IN GEAR CUTTING OPERATIONS
M. Civera and O. Trenti Feb. 1984 9 p ref Transl. into ENGLISH from Metall. Ital. (Italy), no. 6, 1983 p 432-434
(BLL-BISI-Trans-22345-(9022.06)) Avail: British Library Lending Div., Boston Spa, Engl.: £10.00; Overseas $22.50

A test method is proposed for assesing machinability in gear cutting by involute profile generation with a scaled down job to restrict the metal consumption and the operating time. The test and the assessment criteria are described. E.A.K.

N85-28360 Metals Society, London (England).
NEW METHOD FOR DETERMINING STAMPABILITY OF SHEET MATERIALS
V. B. Rudasev, V. K. Belosevich, L. A. Apostolov, and I. A. Bukhbinder 26 Apr. 1984 8 p refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved., Chernaya Met. (USSR), no. 9, 1983 p 76-79
(BLL-BISI-22486-(9022.06)) Avail: British Library Lending Div.,

Boston Spa, Engl.: UK £14.25; Overseas $33.75

Using the coefficient of limiting deformation as the criterion of stampability, an investigation was made of the influence of different clamping forces stampabilility of sheet steels when different lubricants are used. The procedure for determining the coefficient of limiting deformation is given. The applicability of the proposed method for determining stampability was checked by establishing an interrelation between the proposed coefficient and the degree of drawing, which is the coefficient upon which another method for determining stampability is based. An investigation was made of the dependence of the coefficient of limiting deformation and consequently stampability, on the mechanical properties of low-carbon steel 08Yu and low-alloy steel 08GSYuT. Author

N85-28361 British Library Lending Div., Boston Spa (England).
EXHAUST SYSTEMS FOR PASSENGER VEHICLES: TEST PROCEDURE FOR RESISTANCE TO INTERNAL CORROSION OF SILENCERS
Jan. 1984 9 p Transl. into ENGLISH of German Standard DIN-71500, part 1, draft, Dec. 1981
(BLL-BISI-Trans-22360-(9022.06); DIN-71500-Pt-1) Avail: British Library Lending Div., Boston Spa, Engl.: £10.00; Overseas $22.50

This standard describes a test procedure for assessing the internal corrosion of silencers for the combustion engines with external ignition which are situated in the front position in passenger vehicles. The test procedure serves for comparative assessment of the corrosion resistance of various silencers. Author

N85-28362 Metals Society, London (England).
TECHNICAL INFORMATION: WELDABILITY OF STAINLESS STEEL. PART 1: AUSTENITIC STAINLESS STEEL
L. Mompean Rodriguez 16 Feb. 1984 22 p refs Transl. into ENGLISH from Rev. de Soldadura (Spain), v. 12, no. 2, Apr./Jun. 1982 p 51-58
(BLL-BISI-Trans-22456-(9022.06)) Avail: British Library Lending Div., Boston Spa, Engl.: £16.75; Overseas $37.50

The metallurgical aspects of interest when welding austenitic stainless steels are described. Carbide precipitation, the influence of certain elements on cracking, filler materials and heat treatment is discussed in detail. Author

N85-28363 Metals Society, London (England).
EXAMPLES OF APPLICATION OF MACHINABILITY TESTS
D. Paganoni Jan. 1985 10 p Transl. into ENGLISH from Met. Ital. (Italy), no. 6, 1983 p 435-438
(BLL-BISI-Trans-22346-(9022.06)) Avail: British Library Lending Div., Boston Spa, Engl.: UK £10.000; Overseas $22.50

The requisite data is given for adjusting the manufacturing process of calcium steels. Data was derived from an accelerated wear test. The machinability indices furnished by that test are given for free cutting boron steels of recent manufacture. The results obtained in drilling tests at increasing speeds are given. R.J.F.

N85-28364 Metals Society, London (England).
PRODUCTION OF THIN-WALLED ELECTRICITY WELDED TUBES WITH REDUCED INTERNAL FLASH
V. M. Vlasov, V. Z. Grinberg, S. M. Gazman, E. M. Khalamez, and V. V. Eriklintsev Jan. 1984 9 p refs Transl. into ENGLISH from Stal (USSR), no. 7, 1983 p 50-51
(BLL-BISI-Trans-22381-(9022.06)) Avail: British Library Lending Div., Boston Spa, Engl.: £14.25; Overseas $33.75

An examination is made of a welding stand with horizontal arrangement of the roll axes for the production of thin-walled electrically welded tubes with low and stable internal flash. Preliminary reduction of the feedstock tube is recommended for stabilization of both the length of the welding zone and the position of the point of convergence of the edges. Author

N85-28365 Metals Society, London (England).
ASSESSING THE MACHINABILITY OF GEARWHEEL STEELS DURING MANUFACTURE
F. Rabezzana 15 Mar. 1984 20 p refs Transl. into ENGLISH from Met. Ital. (Italy), no. 6, 1983 p 408-416
(BLL-BISI-Trans-22343-(9902.06)) Avail: British Library Lending Div., Boston Spa, Engl.

The introduction of gearwheel steels containing calcium and sulfur, to replace leaded steels and standard low-sulfur steels, demands accurate assessment of workability. Methods used in laboratory-simulation and production tests on auto-lathes are described. R.J.F.

N85-28366 Metals Society, London (England).
HIGH-SPEED LONGITUDINAL WELDING OF PIPES BY AUTOMATIC SUBMERGED ARC PROCESS
15 Mar. 1984 25 p refs Transl. into ENGLISH from Fils Tubes Bandes Profile (France), v. 16, no. 95, Jun. - Jul. 1983 p 19-25
(BLL-BISI-Trans-22340-(9902.06)) Avail: British Library Lending Div., Boston Spa, Engl.

Methods using 3 and 4 electrodes are described, including delta and Scott arrangements, d.c. and a.c. processes, and the shunt system. Advice is given on selection of method and results are discussed. Author

N85-28367 Metals Society, London (England).
PRODUCTION OF ELECTRICALLY WELDED TUBES WITH REMOVED INTERNAL FLASH
V. M. Shvarts Dec. 1983 7 p Transl. into ENGLISH from Stal. (USSR), no. 7, 1983 p 51-52
(BLL-BISI-Trans-22382-(9022.06)) Avail: British Library Lending Div., Boston Spa, Engl.

An examination is made of the internal flash removers used on the 20-102 and 20-114 electric welding tube mills of the Novosibirsk Works. The reduced output of the mills during the production of electrically welded tubes with removed internal flash can be improved by stabilizing the welding process and increasing the life of the cutters. Author

N85-28368 Metals Society, London (England).
FORMATION OF A FINE STRUCTURE DURING SHOCK WAVE WELDING
S. Yu. Kolesnikov Jan. 1984 9 p refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved. Chern. Met. (USSR), no. 7, 1983 p 84-88
(BLL-BISI-Trans-22401-(9022.06)) Avail: British Library Lending Society, London

Experiments were carried out in which the strengths of the slung and stationary plates, the letter on a steel base or an air cushion, were determined. The plates were of copper and 12Kh18N19T steel. X-ray line shape was analyzed harmonically to find the parameters of the fine structure. X-ray line widenings recorded provide information as to the substructure. Author

N85-28369 Metals Society, London (England).
STEEL TUBES
Jan. 1984 37 p Transl. into ENGLISH from French Std. NF-A-49-400, Mar. 1982
(BLL-BISI-Trans-22064-(9022.06)) Avail: British Library Lending Div., Boston Spa, Engl.

The requirements for longitudinally electric resistance welded steel tubes ($17.2 < \text{or} = D < \text{or} = 406.4$ mm) are for the transport of pressurized fluids are presented. Dimensions and Technical delivery conditions are stated. G.L.C.

N85-28370 Metals Society, London (England).
EXAMINATION OF THE REGIONS OF THE JOINT OF SHEETS BONDED BY THE EXPLOSIVE WELDING TECHNIQUE
H. Dyja Jan. 1984 15 p refs Transl. into ENGLISH from Hutnik (Katowice, Poland), no. 1/7, 1982 p 9-13
(BLL-BISI-Trans-22352-(9022.06)) Avail: British Library Lending Div., Boston Spa, Engl.

The regions adjacent to the joints of 18G2A and 1H13 steel sheets bonded by the explosive welding technique were examined. Observations of the structure by optical, scanning and electronic transmission microscopes were carried out. The materials were

tested for hardness and their mechanical properties are microanalyzed. E.A.K.

N85-28371*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
OPERATING CHARACTERISTICS OF A 0.87 kW-hr
Stuart H. Loewenthal, Herbert W. Scibbe, Richard D. Parker, and Erwin V. Zaretsky 23 Aug. 1985 18 p refs Presented at 20th Intersoc. Energy Conversion Eng. Conf. (IECEC), Miami Beach, Fla., 18-23 Aug. 1985; sponsored by SAE, ANS, ASME, IEEE, AIAA, ACS and American Institute of Chemical Engineers
(NASA-TM-87038; E-2535; NAS 1.15:87038) Avail: NTIS HC A02/MF A01 CSCL 10C

Discussion is given of the design and loss characteristics of 0.87 kW-hr (peak) flywheel energy storage module suitable for aerospace and automotive applications. The maraging steel flywheel rotor, a 46-cm- (18-in-) diameter, 58-kg (128-lb) tapered disk, delivers 0.65 kW-hr of usable energy between operating speeds of 10,000 and 20,000 rpm. The rotor is supported by 20- and 25-mm bore diameter, deep-groove ball bearings, lubricated by a self-replenishing wick type lubrication system. To reduce aerodynamic losses, the rotor housing was evacuated to vacuum levels from 40 to 200 millitorr. Dynamic rotor instabilities uncovered during testing necessitated the use of an elastometric-bearing damper to limit shaft excursions. Spindown losses from bearing, seal, and aerodynamic drag at 50 millitorr typically ranged from 64 to 193 W at 10,000 and 20,000 rpm, respectively. Discharge efficiency of the flywheel system exceeded 96 percent at torque levels greater than 21 percent of rated torque. Author

N85-28372*# Hamilton Standard, Windsor Locks, Conn.
MULTI-MESH GEAR DYNAMICS PROGRAM EVALUATION AND ENHANCEMENTS Final Report
Linda Smith Boyd and James Pike May 1985 128 p refs
(Contract NAS3-23928)
(NASA-CR-174747; NAS 1.26:174747) Avail: NTIS HC A07/MF A01 CSCL 13I

A multiple mesh gear dynamics computer program was continually developed and modified during the last four years. The program can handle epicyclic gear systems as well as single mesh systems with internal, buttress, or helical tooth forms. The following modifications were added under the current funding: variable contact friction, planet cage and ring gear rim flexibility options, user friendly options, dynamic side bands, a speed survey option and the combining of the single and multiple mesh options into one general program. The modified program was evaluated by comparing calculated values to published test data and to test data taken on a Hamilton Standard turboprop reduction gear-box. In general, the correlation between the test data and the analytical data is good. R.J.F.

N85-28373*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
LUBRICANT AND ADDITIVE EFFECTS ON SPUR GEAR FATIGUE LIFE
Dennis P. Townsend, Erwin V. Zaretsky, and Herbert W. Scibbe 1985 28 p refs To be presented at 1985 Lubrication Conf., Atlanta, 8-10 Oct. 1985, sponsored by ASME and American Society of Lubrication Engineers
(NASA-TM-87044; E-2482; NAS 1.15:87044) Avail: NTIS HC A03/MF A01 CSCL 13I

Spur gear endurance tests were conducted with six lubricants using a single lot of consumable-electrode vacuum melted (CVM) AISI 9310 spur gears. The sixth lubricant was divided into four batches each of which had a different additive content. Lubricants tested with a phosphorus-type load carrying additive showed a statistically significant improvement in life over lubricants without this type of additive. The presence of sulfur type antiwear additives in the lubricant did not appear to affect the surface fatigue life of the gears. No statistical difference in life was produced with those lubricants of different base stocks but with similar viscosity, pressure-viscosity coefficients and antiwear additives. Gears tested with a 0.1 wt % sulfur and 0.1 wt % phosphorus EP additives in the lubricant had reactive films that were 200 to 400 (0.8 to 1.6 microns) thick. Author

N85-28374# Southwest Research Inst., San Antonio, Tex.
CLEAN-BURNING DIESEL ENGINES Interim Report, Jul. 1983 - Dec. 1984
H. E. Dietzmann Dec. 1984 116 p
(Contracts DAAK70-82-C-0001; DAAK70-85-C-0007)
(AD-A152606; AFLRL-178) Avail: NTIS HC A06/MF A01 CSCL 21/7

Gaseous, particulate and unregulated emissions were measured from four diesel forklift engines under a variety of steady-state conditions. An EPA certification fuel was used to determine emission rates for CO, CO2, NOx, HC, particulate, sulfur dioxide, suflate, organic sulfides, phenols, DOAS (Diesel Odor Analysis System) ordor and aldehydes. Four engines included in this evaluation were: Deutz F3L 912W, Deutz F4L912W, Perkins 4.2032 and Perkins 4.2482. Additional emission tests were conducted with Deutz F3L 912W with MIL-F-46162A(MR) and MIL-F-46162B(ME) reference fuels. Data from Phase 1 is also included for comparison purposes. The effect of selected induced faults on emission rates of the Deutz F3L 912W was also determined. These induced faults included intake air restriction, exhaust restriciton and injection pump timing. Emission rates were reported in g/he, g/hp-hr and concentration, i.e., ppm, percent, micrograms/cu m. GRA

N85-28375# Du Pont de Nemours (E. I.) and Co., Aiken, S.C.
ROBOTIC SAFETY SYSTEMS AND METHODS: SAVANNAH RIVER SITE
J. H. Addison, Jr. Dec. 1984 25 p refs
(Contract DE-AC09-76SR-00001)
(DE85-008261; DPST-84-907) Avail: NTIS HC A02/MF A01

A study of robot safety is presented, which includes: (1) an industry survey of currently available devices and techniques; (2) trends in safety system research; and (3) recommendations for working safely with robots. With the use of available technology, strict adherence to procedure, and two level training, a high safety standard and awareness can be attained. The skill of the people who interact with the robot is important in achieving this standard. DOE

N85-28376# Pacific Northwest Lab., Richland, Wash.
TRIBOLOGICAL SINKS: MONEY DOWN THE DRAIN
C. H. Imhoff [1985] 11 p refs
(Contract DE-AC06-76RL-01830)
(DE85-010019; PNL-SA-12865) Avail: NTIS HC A02/MF A01

The Energy Conversion and Utilization Technologies (ECUT) Program initiated a program to study tribology and how to reduce friction and wear. ECUT conducted six surveys to gather information about the tribology problem in USA. The topics of the surveys were: review of tribological sinks in six major industries; the reduction in tribological energy losses in the transportation and electric utilities sectors; an assessment of government tribology programs; an assessment of industrial attitudes toward generic research needs in tribology; the identification of tribological R and D needs for lubrication of advanced heat engines; and the energy conservation potential of surface modification technologies. Results of these surveys are summarized. DOE

N85-28377# Sandia Labs., Albuquerque, N. Mex.
LASER WELDER FOR FABRICATING NEUTRON TUBES
J. H. Borrego and B. E. Barnaby Mar. 1985 86 p refs
(Contract DE-AC04-76DP-00789)
(DE85-009965; SAND-84-1852) Avail: NTIS HC A05/MF A01

A laser welder for use on very small vacuum devices fabricated from high temperature melting point alloys and refractory metals was developed. Intended primarily for Research and Development, the welder includes a 400-W, pulsed Nd:YAG laser, welding chamber, positioning system, closed circuit TV monitor, and a computer controller. Some advantages of laser welding are: precision, minimal heat affected zone, and it requires no filler metal. Also discussed is a technique for developing weld parameters and illustrate and evaluate neutron tube welds. DOE

N85-28378# Pennsylvania State Univ., University Park. Dept. of Materials Science and Engineering.
EXPERIMENTAL AND THEORETICAL STUDIES ON TRANSPORT PROCESSES IN LASER WELDING
T. DebRoy 25 Mar. 1985 3 p
(Contract DE-FG02-84ER-45158)
(DE84-008572; DOE/ER-45158/T1) Avail: NTIS HC A02/MF A01

Progress was made in areas related to fluid flow, heat transfer and alloying element loss during laser welding of stainless steels. The progress is reported under the following headings: weld pool temperature; alloying element vaporization rate, and solute loss; absorption of CO2 laser by stainless steels; numerical calculation of fluid flow in laser melted pools; and microstructure of the welded material. DOE

N85-28379# Argonne National Lab., Ill.
CERAMIC TURBOCHARGERS: A CASE STUDY OF A NEAR-TERM APPLICATION OF HIGH-STRENGTH CERAMICS
Robert P. Larsen and Larry R. Johnson Aug. 1984 22 p refs
(Contract W-31-109-eng-38)
(DE85-006495; ANL/CNSV-47) Avail: NTIS HC A02/MF A01

The most likely near term, high volume application of structural ceramics in heat engines is in turbocharger rotors. These will be the first mass produced ceramic components applicable to both gasoline and diesel engines. The principal objective is to estimate relative costs of ceramic turbocharger rotors vs conventional metal rotors. Thus the focus is on the economics, manufacturing, marketing strategies, and benefits related to the introduction and use of ceramic turbochargers, rather than on the detailed technical issues surrounding the microstructure and processing aspects of the new ceramic technologies. The use of ceramics first in rotors and later in other turbocharger components was significant impacts on cost, size, performance, and overall market growth of turbos are given. DOE

N85-28380# Argonne National Lab., Ill. Center for Transportation Research.
FUTURE OF CERAMIC TURBOCHARGERS: PROMISES AND PITFALLS
R. P. Larsen Nov. 1984 8 p refs Presented at the 22nd Automotive Technol. Develop. Contractors' Coordination Meeting, Dearborn, Mich., 29 Oct. - 2 Nov. 1984
(Contract W-31-109-eng-38)
(DE85-006209; CONF-8410103-9) Avail: NTIS HC A02/MF A01

The turbocharger is the most likely near term application of a mass produced ceramic component applicable to both gasoline and diesel engines. A ten fold increase in turbocharger use is projected for the US market over the next eight years, and the total worldwide demand at the end of that time will exceed six million units per year. Ceramic turbochargers are expected to play a significant role in that growth. Overall turbocharger costs could decline as much as 50% during the next eight years, largely due to the use of ceramics, and ceramic turbochargers which could capture more than 75% of the total market. The difficulties of mass producing ceramic rotors and other components are discussed as a primary pitfall to the introduction and development of this advanced technology. DOE

N85-28381# Materialpruefungsanstalt, Stuttgart (West Germany). Staatliche Materialpruefungsanstalt.
INVESTIGATION OF REACTION LAYER FORMATION IN HIGH-LOAD CAPACITY LUBRICATING OILS [UNTERSUCHUNG UEBER DIE REAKTIONSSCHICHTBILDUNG BEI HOCHBELASTBAREN SCHMIEROELEN]
Mohammad-Ali Khosrawi 1983 184 p refs In GERMAN Sponsored by Deutsche Forschungsgemeinschaft
(MPA-83-01; ISSN-0721-4529) Avail: NTIS HC A09/MF A01

Reaction layer formation mechanisms and their effects in the mixing friction domain between lubricating oils and reactive steel slide materials were studied. Tests were performed on a pin-disk setup to determine the effect of reaction film formation on load capacity, wear behavior, and polishing; additives were mixed in the oils. Pure sulfur-phosphor compounds and chelate compounds form reaction layers with active participation of the slide materials, while the dithiophosphates of the metals Zn and Pb (ZnDTp and PbDTP) introduce the formation themselves. The combination of both additive types leads to an overlapping of the wear effects of both types, and can lead to low friction values. All the investigated oils lead to extremely smooth sliding surfaces, as long as cleavage wear due to adhesive contact does not start. The wear effect of special oils for star-shaped joints is described. It is suggested to use the terms sacrifical and nonsacrifical lubrication with respect to reaction film formation. Optimal lubrication is achieved when a controlled tribochemically induced wear exists. Author (ESA)

N85-28150# Joint Publications Research Service, Arlington, Va.
CALCULATION OF FRICTION AT SPHERICAL BEARING JOURNALS IN TURBOMACHINES Abstract Only
G. A. Khanin and L. G. Khanin *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-85-004) 15 May 1985 p 31 Transl. into ENGLISH from Teplotekhn. (Moscow), no. 10, Oct. 1984 p 61-63 (For primary document see N85-28142 17-31)
Avail: NTIS HC A06/MF A01

N85-28186# Joint Publications Research Service, Arlington, Va.
ROBOTS, AUTOMATIC DEVICES INSIDE VW'S WOLFSBURG PLANT
In its West Europe Rept.: Sci. and Technol. (JPRS-WST-84-024) 10 Jul. 1984 p 34-37 Transl. into ENGLISH from Roboter (Landsberg), Mar. 1984 p 14-16 (For primary document see N85-28183 17-31)
Avail: NTIS HC A04/MF A01

N85-28187# Joint Publications Research Service, Arlington, Va.
FUTURE DIRECTIONS OF ROBOTICS, AUTOMATION IN ITALY
Antonio Strumia *In its* West Europe Rept.: Sci. and Technol. (JPRS-WST-84-024) 10 Jul. 1984 p 38-41 Transl. into ENGLISH from ATA Ing. Automotoristica (Turin), Feb. 1984 p 123-126 (For primary document see N85-28183 17-31)
Avail: NTIS HC A04/MF A01

38 QUALITY ASSURANCE AND RELIABILITY

Includes product sampling procedures and techniques; and quality control.

N85-28382 Metals Society, London (England).
MAGNETIC FLUX LEAKAGE INSPECTION: PRINCIPLES AND APPLICATIONS
F. Forster and P. Neumaier Nov. 1983 15 p refs Transl. into ENGLISH from symp. paper Presented at the Deutsche Gesellschaft fuer Zerstoerungsfreie Pruefung e.V. Intern. Symp., Saarbruecken, France, 17-19 Sep. 1979
(BLL-BISI-Trans-22248-(9022.06)) Avail: British Library Lending Div., Boston Spa, Engl.: £10.00; Overseas $22.50

Magnetic flux leakage is one of the oldest non-destructive testing methods. The workpiece requiring examination is magnetized by means of a suitably applied magnetic dc or ac field. The flux leakage field forming above a defect is detected with magnetic particles, induction or magnetic probes or a magnetic tape. Author

N85-28383 Metals Society, London (England).
PROPER QUALITY OF ANTICORROSION WORK NO MATTER HOW BAD THE ATMOSPHERIC CONDITIONS
W. Bahlmann and D. Umlauf Nov. 1984 20 p Transl. into ENGLISH from Ochr. Przed. Koroz. (Poland), no. 3, 1982 p 57-63
(BLL-BISI-Trans-22080-(9022.06)) Avail: British Library Lending Div., Boston Spa, Engl.: UK £20.50; Overseas $45.00

Advice on the application of anticorrosion coatings to ensure

adequate protection even under less than ideal working conditions is given. The effects of humidity, air temperature, and dew point are discussed, as well as the effects of surface contaminants. Scheduling problems, as well as design and assembly influences are also examined. R.J.F.

N85-28384# Metals Society, London (England).
STATISTICAL MODELS USED IN ANALYZING THE QUALITY OF WELDED TUBES
Yu. P. Khanov 27 Feb. 1984 7 p Transl. into ENGLISH from Stal (USSR), no. 5, 1983 p 62-63
(BLL-BISI-Trans-22232-(9022.06)) Avail: British Library Lending Div., Boston Spa, Engl.: £20.50; overseas $45.00

Models for evaluating tube quality are given. They are used for forecasting quality changes, and so for selecting the optimum production structure. Details are given for calculating optimum process parameters, and for the use of loopers. Optimum rolling speeds are found. Author

N85-28385 Metals Society, London (England).
QUALITY TESTING TO THE SPECIFICATIONS OF THE STAHL-EISEN-PRUEFBLATT 1570/71 USING AN AUTOMATIC IMAGE ANALYSIS SYSTEM
H. Mehlo 3 Jan. 1985 15 p refs Transl. into ENGLISH from Arch. Eisenhuttenwes (West Germany), v. 54, no. 10, 1983 p 411-414
(BLL-BISI-Trans-22253-(9022.06)) Avail: British Library Lending Div., Boston Spa, Engl.

Examination of steel samples for nonmetallic inclusions was completed. Development of an automatic method for classifying different inclusions was undertaken. Measurement of shape parameters and polished sections of the inclusions was employed. Detection of bands by clustering as a function of the Feret diameter with and across the band direction was used. Assessment of the steel quality using the K or M method of the test specification is presented. Author

N85-28386 Metals Society, London (England).
DIFFERENTIAL BETWEEN CRACK AND PSEUDO-CRACK INDICATIONS BY MEANS OF OBJECTIVE MAGNETIC FLUX LEAKAGE TESTING
G. Dobmann, H. Persch, G. Huebachen, and U. Coehne Jan. 1983 13 p refs Transl. into ENGLISH from symp. paper Presented at the Deutsche Gesellschaft fuer Zerstoerungsfreie Pruefung e.V. Intern. Symp., Saarbruecken, France, 17-19 Sep. 1979
(BLL-BISI-Trans-22033-(9022.06)) Avail: British Library Lending Div., Boston Spa, Engl.: £10.00; Overseas $22.50

The difficulties besetting the interpretation of sharp, cracklike indications from the metallurgical structure obtained during the magnetic particle inspection of the heat-affected zone of butt welds require lengthy verifications and repairs on nuclear components. This report surveys the current state of knowledge and formulates the first expressions for the application of objective magnetic flux leakage methods. Author

N85-28387 Metals Society, London (England).
INSPECTION OF WELDS AND THE FACTORS IMPROVING ITS EFFECTIVENESS IN WELDED STRUCTURE FABRICATION
O. Izdinsky 20 Dec. 1983 10 p refs Transl. into ENGLISH from Zvaranie (Czechoslovakia), no. 8, 1981 p 234-236
(BLL-BISI-Trans-22194-(9022.06)) Avail: British Library Lending Div., Boston Spa, Engl.

Problems concerning the position and effectiveness of inspection on the fabrication of welded structures are discussed. Quality requirements, weld classifications, personnel evaluation, and ultrasonic testing are covered. R.J.F.

N85-28388 Metals Society, London (England).
NON-DESTRUCTIVE TESTING OF HF-WELDED PIPE
H. J. Wahl and F. O. Koch 20 Dec. 1983 11 p ref Transl. into ENGLISH from Bander Bleche Rohre (West Germany), v. 24, no. 8, 1983 p 221-224
(BLL-BISI-Trans-22182-(9022.06)) Avail: British Library Lending Div., Boston Spa, Engl.

Non-destructive testing plays a major role in quality assurance. Next to hydrostatic testing, non-destructive testing (NDT) is the sole means for 100% pipe inspection. Mechanized testing installations were employed for a considerable time for the examination of both weld and base metal. The testing procedure for the production control and the final acceptance of high-frequency welded pipe according to DIN 17.172 is outlined. Author

N85-28389 Metals Society, London (England).
PRINCIPAL QUALITY ASSURANCE MEASURES IN THE MANUFACTURE OF HF-WELDED HIGH-PRESSURE LINEPIPE
F. O. Koch 20 Dec. 1983 15 p refs Transl. into ENGLISH from 3R Intern. (West Germany), v. 22, no. 3, 1983 p 88-93
(BLL-BISI-Trans-21690-(9022.06)) Avail: British Library Lending Div., Boston Spa, Engl.

Quality assurance measures introduced into the manufacture of HF-pressure welded pipes are discussed. Desired product characterisics for HP-gas pipes include: (1) dimensional accuracy; (2) leaktightness; (3) resistance to brittle cracking; (5) resistance to longitudinal cracking; and (6) adequate deformability and good weldability. Many of these characteristics are already present in suitable pipe steels. B.W.

N85-28390# City Coll. of the City Univ. of New York. Dept. of Mathematics.
INEQUALITIES FOR DISTRIBUTIONS WITH INCREASING FAILURE RATE
M. Brown 23 Dec. 1984 18 p
(Grant AF-AFOSR-0095-84)
(AD-A152812; CUNY-MB84-01; AFOSR-85-0291TR) Avail: NTIS HC A02/MF A01 CSCL 12/1

Inequalities are obtained for IFR (increasing failure rate) distributions. These include bounds on the renewal function for a renewal with IFR interarrival time, and bounds on the quality of exponential approximation to IFR distributions. GRA

N85-28391*# Massachusetts Inst. of Tech., Cambridge. Lab. for Information and Decision Systems.
OPTIMALLY ROBUST REDUNDANCY RELATIONS FOR FAILURE IN UNCERTAIN SYSTEMS
Xi-Cheng Lou, Alan S. Willsky, and George C. Verghese Mar. 1985 29 p refs
(Grant NGL-22-009-124; Contract N00014-77-C-0224; Grant AF-AFOSR-0258-82)
(NASA-CR-175953; NAS 1.26:175953; AD-A152921; LIDS-P-1447) Avail: NTIS HC A03/MF A01 CSCL 12A

All failure detection methods are based, either explicitly or implicitly, on the use of redundancy, i.e., on (possibly dynamic) relations among the measured variables. The robustness of the failure detection process consequently depends to a great degree on the reliability of the redundancy relations, which in turn is affected by the inevitable presence of model uncertainities. In this paper we address the problem of determining redundancy relations that are optimally robust, in a sense that includes several major issues of importance in practical failure detection, and that provides a significant amount of intuition concerning the geometry of robust failure detection. We also give a procedure, involving the construction of a single matrix and its singular value decomposition, for the determination of a complete sequence of redundancy relations, ordered in terms of their level of robustness. This procedure also provides the basis for comparing levels of robustness is redundancy provided by a different sets of sensors. GRA

N85-28392# California Univ., Livermore. Lawrence Livermore Lab.
INTEGRATING QUALITY ASSURANCE AND RESEARCH AND DEVELOPMENT
J. J. Dronkers 15 Feb. 1985 5 p refs Presented at the 16th ASQC Ann. Calif. Quality Week Conf., San Jose, Calif., 22 Mar. 1985
(Contract W-7405-eng-48)

(DE85-007974; UCRL-92210; CONF-8503107-1) Avail: NTIS HC A02/MF A01

Quality assurance programs cannot be transferred from one organization to another without attention to existing cultures and traditions. Introduction of quality assurance programs constitutes a significant change and represents a significant impact on the organizational structure and operational mode. Quality assurance professionals are change agents, but do not know how to be effective ones. Quality assurance as a body of knowledge and experience can only become accepted when its practitioners become familiar with their role as change agents. DOE

N85-28393# Sueddeutsches Kunststoff-Zentrum, Wuerzburg (West Germany).
QUALITATIVE AND QUANTITATIVE DETERMINATION OF AGING BY MECHANICAL TESTS [QUALITATIVE UND QUANTITATIVE ERFASSUNG DER ALTERUNG DURCH MECHANISCHE PRUEFUNGEN]
G. Poschet [1984] 6 p In GERMAN
Avail: NTIS HC A02/MF A01

The weathering effects on plastics were determined by mechanical measurements. The choice of the testing method depends on the type of loading, the sample size and the type of plastic. The weathering effects can be quantitatively determined by notch impact tests and impact tests with slot or double-U notches; and by impact bending tests at low temperatures. The impact tension test is more difficult but can be used on thin samples. The tension test is suited for samples with a yield point. Tensile strength and tear strength are less sensitive to aging effects than tear strain. For plasticized samples the elastic modulus is demonstrated as a sensitive measuring quantity. In the tension crack formation test, the time until fracture or first crazing are weathering quantity indicators. Author (ESA)

N85-28394# Kema (N. V.), Arnhem (Netherlands). Dept. of Mechanical, Thermohydraulic Analysis and Metallurgical Research.
INSPECTION EVALUATION AND REPAIR OF THE FLAWED FEEDWATER NOZZLE OF THE 50 MWe DODEWAARD GKN BOILING WATER REACTOR
A. P. A. M. Beijers, L. B. Dufour, G. M. vanDijk, R. Huizing, R. M. vanKuijk, and J. vanLiere 1984 9 p refs Repr. from Kema Sci. and Tech. Repts. (Netherlands), v. 2, no. 6, 1984 p 49-60 Original contains color illustrations
(ISBN-90-353-0017-3; ISSN-0167-8590) Avail: NTIS HC A02/MF A01

Repairs to a boiling water reactor feed water nozzle were carried out after inspection using eddy currents from within the pressure vessel revealed that the nozzle was flawed. Ultrasonic and photographic techniques failed to detect the flaws. The equivalent flaw depths prior to the refuelling outage were determined by extrapolation and by calculating fatigue flaw growth by linear elastic fracture mechanics. Intensive preparations enabled a thermal sleeve to be fitted during routine refuelling.
Author (ESA)

N85-28395# Deutsch (Karl), Wuppertal (West Germany). Pruef- und Messgeraetebau.
ULTRASONIC FLAW DETECTOR WITH MICROCOMPUTER INTERPRETATION Final Report, Dec. 1982
Volker Deutsch and Werner Roddeck Bonn Bundesministerium fuer Forschung und Technologie Dec. 1984 25 p In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-84-272; ISSN-0340-7608) Avail: NTIS HC A02/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 5.50

An ultrasonic flaw detector including a conventional ultrasonic test module and a microcomputer was developed. The system indicates and prints out the result directly without subjective influences. By means of an alphanumeric display and a keyboard a dialog for adjustment is carried out with the user, which almost excludes errors. Echoes can be evaluated using different methods. Adjustment parameters and test results are printed for documentation. Author (ESA)

39 STRUCTURAL MECHANICS

Includes structural element design and weight analysis; fatigue; and thermal stress.

For applications see *05 Aircraft Design, Testing and Performance* and *18 Spacecraft Design, Testing and Performance*.

N85-28396 Metals Society, London (England).
STATE OF STRESS AND PENETRATION OF PLASTIC DEFORMATION IN FORMING
P. Macura 20 Dec. 1983 19 p refs Transl. into ENGLISH from Hutnicke Listy (Czechoslovakia), no. 11, 1982 p 777-783
(BLL-BISI-22199-(9022.06)) Avail: British Library Lending Div., Boston Spa, Engl.: UK £20.50; Overseas $45.00

An experimental analysis of the state of stress and of the depth of penetration of plastic deformation when rolling in smooth rolls, by means of the photoplasticimetric method was studied.
Author

N85-28397# Shock and Vibration Information Center (Defense), Washington, D. C.
THE SHOCK AND VIBRATION DIGEST, VOLUME 17, NO. 1 Monthly Report
Judith Nagle-Eshleman, ed. Jan. 1985 107 p refs
(AD-A151051) Avail: SVIC, Code 5804, Naval Research Lab., Washington, D.C. 20375 CSCL 20/11

Articles on Sound Intensity Measurement and Continuum Modeling of Lattice Structures are presented. For individual titles, see N85-28398 through N85-28399.

N85-28398# Plessey Marine Research Unit, Templecombe (England).
SOUND INTENSITY MEASUREMENT **c71**
P. S. Watkinson *In* Shock and Vibration Information Center The Shock and Vibration Digest, Vol. 17. No. 1 Jan. 1985 p 3-14 refs (For primary document see N85-28397 17-39)
Avail: SVIC, Code 5804, Naval Research Lab., Washington, D.C. 20375 CSCL 20/11

The literature relating to sound intensity measurement is reviewed. Principles, measurement errors, instrumentation, applications, and interpretation of measurements are covered. The applications considered are the measurement of sound power output by a source, transmission loss, absorption, source radiation characteristics, transient noise sources, and measurement of flow. Author

N85-28399# Dayco Corp., Springfield, Mo. Technical Center.
CONTINUUM MODELING OF LATTICED STRUCTURES
S. Abrate *In* Shock and Vibration Information Center The Shock and Vibration Digest, Vol. 17, No. 1 Jan. 1985 p 15-21 refs (For primary document see N85-28397 17-39)
Avail: SVIC, Code 5804, Naval Research Lab., Washington, D.C. 20375 CSCL 20/11

Continuum modeling is an efficient method for the analysis of latticed structures. An equivalent continuum model is sought in order to model the overall behavior of a discrete structure. This approach has been applied to several types of structures for many problems, including eigenvalue, transient response, large displacements, buckling, and damping analyses. Author

N85-28400# Shock and Vibration Information Center (Defense), Washington, D. C.
THE SHOCK AND VIBRATION DIGEST, VOLUME 17, NO. 2 Monthly Report
Judith Nagle-Eshleman, ed. Feb. 1985 141 p refs
(AD-A153129) Avail: SVIC, Code 5804, Naval Research Lab., Washington, D.C. 20375 CSCL 20/11

Two major topics are discussed: the first deals with the effects

of seismic waves on ground motion and structures, mechanisms and prediction of earthquakes, abnormal animal behavior before earthquakes, and disturbances in the ionosphere. The second is a literature survey focusing on the dynamics of plastic behavior of structures. Also provided in the second work are works on effects of transverse shear and rotary inertia; recent publications on beams, plates, and shells; and dynamic plastic buckling. Also included in the volume are book reviews, news briefs, and approximately 285 abstracts from works relevant to the fields of shock and vibration. For individual titles, see N85-28401 through N85-28402.

N85-28401# National Research Inst., Bankura (India).
THE EFFECTS OF SEISMIC WAVES
Sasadhar De *In* Shock and Vibration Information Center The Shock and Vibration Digest, Vol. 17, No. 2 Feb. 1985 p 3-32 refs (For primary document see N85-28400 17-39)
Avail: SVIC, Code 5804, Naval Research Lab., Washington, D.C. 20375 CSCL 20/11

The effects of seismic waves on ground motion and structures, mechanisms and prediction of earthquakes, abnormal animal behavior before earthquakes, and disturbances in the ionosphere are examined. Some recent problems in seismology are described. Author

N85-28402# Liverpool Univ. (England). Dept. of Mechanical Engineering.
RECENT PROGRESS IN THE DYNAMIC PLASTIC BEHAVIOUR OF STRUCTURES, PART 4
Norman Jones *In* Shock and Vibration Information Center The Shock and Vibration Digest, Vol. 17, No. 2 Feb. 1985 p 35-47 refs (For primary document see N85-28400 17-39)
Avail SVIC, Code 5804, Naval Research Lab., Washington, D.C. 20375 CSCL 20/11

Literature published on the dynamic plastic behavior of structures since the previous review in 1981 is surveyed. Additional work on the effects of transverse shear and rotatory inertia; recent publications on beams, plates, and shells; and dynamic plastic buckling is examined. Some comments on scaling and structural crashworthiness are included. Author

N85-28403 Metals Society, London (England).
MEASUREMENT OF FRACTURE MACRO-GEOMETRY IN EVALUATING FRACTURE TOUGHNESS
A. Shtremel 1 Mar. 1984 7 p Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved. Chern. Met. (USSR), no. 5, 1983 p 95-100 (BLL-BISI-Trans-22241-(9022.06)) Avail: British Library Lending Div., Boston Spa, Engl.

A method of measuring fracture and specimen side surface macrogeometries and analyzing them is described. The three dimensions of the reduction on in area field are shown to be stable characteristics of the opening of cracks. R.J.F.

N85-28404 Metals Society, London (England).
TESTS OF LOW-CYCLE FATIGUE OF ELECTED STEELS OF CLASS 11
J. Kucera et al 24 Jan. 1984 23 p refs Transl. into ENGLISH from Strojirenstvi (Czechoslovakia), no. 3, 1982 p 173-180 (BLL-BISI-Trans-22039-(9022.06)) Avail: British Library Lending Div., Boston Spa, Engl.

Tests of the low-cycle fatigue of ten Czechoslovak steel qualities intended for industrial consumers are presented. They are structural welding steels and to utilize them economically it is very advantageous to know the limiting values of their strength and service life under low-cycle fatigue. G.L.C.

N85-28405 Metals Society, London (England).
FRACTURE MECHANICS ANALYSIS OF COLD DRAWN SI-Cr VALVE STEEL
Yin Jiang and Xu Jingfeng 3 Jan. 1984 12 p refs Transl. into ENGLISH from Acta Met. Sinica (China), v. 17, no. 3, 1981 p 259-265
(BLL-BISI-Trans-22216-(9022.06)) Avail: British Library Lending Div., Boston Spa, Engl.

A fracture mechanics approach was used to study cold drawn splitting in Si-Cr valve steel. Cold deformation fracture toughness, the peak value of cold drawn tangential residual tensile stress, and depth of surface blemishes were found to be the three main factors affecting splitting. R.J.F.

N85-28406 Metals Society, London (England).
RELAXATION PROPERTIES AND FATIGUE FRACTURE RESISTANCE OF AUSTENITIC SPRING STEEL
V. R. Baraz et al 1 Mar. 1984 7 p refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved. Chern. Met. (USSR), no. 6, 1983 p 8-89
(BLL-BISI-Trans-22300-(9022.06)) Avail: British Library Lending Div., Boston Spa, Engl.

Relaxation and fatigue properties of high strength wire of 13Kh18N10G3S2M2 steel were studied and compared with 12Kh18N1OT steel and 4OKNKhMVTYu cobalt alloy used for making spring components. After thermomechanical treatment, the 13Kh18N1OG3S2M2 material undergoes marked hardening which is combined with good tempering resistance and fatigue strength. Author

N85-28407 Metals Society, London (England).
LIMITING VALUES OF STRESS STATE INDEX AFTER RUPTURE OF METALS
V. Ya. Lyuts et al 1 Mar. 1985 7 p refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved. Chern. Met. (USSR), no. 6, 1983 p 43-45
(BLL-BISI-Trans-22293-(9022.06)) Avail: British Library Lending Div., Boston Spa, Engl.

Functions, expressed in terms of Poisson's ratio waver deduced for finding the limiting values of the stress state index after the rupture of metals. Author

N85-28408 Metals Society, London (England).
ON VALIDITY OF THRESHOLD VALUES OF FATIGUE STRENGTH OF STEEL STRUCTURES
V. Hnik et al 20 Dec. 1984 12 p refs Transl. into ENGLISH from Zvaranie (Czechoslovakia), no. 8, 1981 p 225-228
(BLL-BISI-Trans-22192-(9022.06)) Avail: British Library Lending Div., Boston Spa, Engl.

The effect of a great number of cycles with the swing lower than the threshold value of Woehler's curves on the fatigue failure of steel structures were investigated. Propagation of fatigue cracks in loading by a stress spectrum were examined. Application of bilinear Woehler's curves are presented. G.L.C.

N85-28409 Metals Society, London (England).
THE MISES YIELD CONDITION FOR THIN ROTATIONALLY SYMMETRIC SHELLS
N. Nicolov 20 Dec. 1983 10 p refs Transl. into ENGLISH from Mashinostr. (Bulgaria), no. 12, 1982 p 535-537
(BLL-BISI-Trans-22047-(9022.06)) Avail: British Library Lending Div.; Boston Spa, Engl.

Rigid body yield condition in the sectional quantities space is applied to determine the limiting allowable load on rotationally symmetric shells made from an unstrengthened plastic. Data on two methods differing in principle for determining the yield condition are presented. The yield condition under the Landgraf method for rotationally symmetric shells is analyzed. Special cases are obtained with a boundary transition and the two methods are compared. E.A.K.

N85-28410 Metals Society, London (England).
THE FATIGUE PROPERTIES OF WELDS AT LOW TEMPERATURE, ACCORDING TO THE TYPE OF STEEL
K. Sato 3 Feb. 1984 16 p refs Transl. into ENGLISH from J. Japan Inst. Met. (Japan), v. 47, no. 9, 1983 p 801-805
(BLL-BISI-Trans-22455-(9022.06)) Avail: British Library Lending Div., Boston Spa, Engl.

An investigation was carried out into fatigue crack propagation behaviour and fatigue fracture toughness, etc., in the case of weldments of 5.5% Ni steel, which was developed for low

temperature use, over the temperature range 95 deg K up to room temperature. Results obtained are compared with those of the previous study into 780 MPa grade high-strength steel. R.J.F.

N85-28411 Metals Society, London (England).
FATIGUE CRACK PROPAGATION CHARACTERISTICS AND FATIGUE FRACTURE TOUGHNESS IN 780 MPa GRADE HIGH STRENGTH STEEL WELDMENTS AT LOW TEMPERATURE
Kiyoshi Sato, Takeo Yokobori, Igarashi Hiroshi, Shin-ichi Nishida, and Hiroki Masumoto 14 Feb. 1984 16 p refs Transl. into ENGLISH from J. Japan Inst. Met. (Japan), v. 47, no. 7, 1983 p 596-602
(BLL-BISI-Trans-22369-(9022.06)) Avail: British Library Lending Div., Boston Spa, Engl.

The fracture toughness, fatigue crack propagation characteristics and the fatigue fracture toughness in low-carbon tempered martensite type on high strength steel weldments within the temperature range of 98 K to room temperature were investigated. E.A.K.

N85-28412 Metals Society, London (England).
EFFECTS OF THE STRUCTURAL STATE IN THERMOBIMETALS ON THEIR RESISTANCE TO MICROSCOPIC PLASTIC DEFORMATION
Yu. A. Bashnin Jan. 1984 9 p refs Transl. into ENGLISH from IZV. Vyssh. Ucheb. Zaved. Chern. Met. (USSR), no. 2, 1983 p 59-61
(BLL-BISI-Trans-22403-(9022.06)) Avail: British Library Lending Div., Boston Spa, Engl.

The article discusses the effects of different degrees of deformation and different thermal cycles on the properties of the component alloys in thermobimetals, also the changes in their structures. The ideal heat treatment conditions are given. Author

N85-28413# Queensland Univ., St. Lucia (Australia). Dept. of Civil Engineering.
BUCKLING AND BRACING OF CANTILEVERS
S. Kitipornchai, P. F. Dux, and N. J. Richter Apr. 1983 34 p refs
(CE-42) Avail: NTIS HC A03/MF A01

The elastic flexural torsional buckling of cantilever I-beams is investigated. The cantilevers have rigid translational and/or rotational restraints at discrete points. The effect of the beam parameter X, the load height, the location of restraint positions along the beam, and the level at which the restraint acts were studied using the finite integral method. Results are presented graphically as ratios of the increased critical load of the partially braced beam and the corresponding critical load of the unbraced beam. The beam load cases considered are concentrated loads and uniformly distributed loads. The effectiveness of the restraint locations and the types of restraint are investigated. Experiments conducted using extruded high strength aluminum I-section are reported. Test results obtained are in reasonable agreement with the theoretical predictions. R.J.F.

N85-28414# Massachusetts Inst. of Tech., Cambridge. Dept. of Materials Science and Engineering.
FATIGUE OF SYNTHETIC FIBERS FOR MARINE ROPE APPLICATIONS
Maryann C. Kenny, J. F. Mandell, and F. J. McGarry Apr. 1984 80 p refs Sponsored by Naval Sea Systems Command
(MIT-R84-2) Avail: NTIS HC A05/MF A01

The deterioration of synthetic fibers for marine rope was analyzed. The following topics are discussed: (1) fatigue behavior of synthetic fibers, yarns, and ropes; and (2) the effects of seawater and concentrated salt solutions on the fatigue of nylon 6,6 fibers. For individual titles, see N85-28415 through N85-28416.

N85-28415# Massachusetts Inst. of Tech., Cambridge. Dept. of Materials Science and Engineering.
FATIGUE BEHAVIOR OF SYNTHETIC FIBERS, YARNS AND ROPES
In its Fatigue of Syn. Fibers for Marine Rope Appl. Apr. 1984 43 p refs Submitted for publication (For primary document see N85-28414 17-39)
Avail: NTIS HC A05/MF A01

The data for S-N fatigue and creep rupture for nylon 6,6 single fibers, interlaced yarns, and small ropes under a variety of loading conditions were analyzed. A similar degradation rate at each level of structure is shown with no apparent influences of interfiber effects. Cyclic lifetimes of single fibers of nylon 6,6 and polyester and aramid can be predicted from a creep rupture model. Consistent with this model, the time to failure is insensitive to frequency over a broad range. For each level of structure the strain at failure is the same whether tested in simple tension or under cyclic or creep loading. Failure modes were generally similar in creep rupture and cyclic fatigue tests; no effect of a slack load on each cycle was evident either in the failure mode or specimen lifetime. E.A.K.

N85-28416# Massachusetts Inst. of Tech., Cambridge. Dept. of Materials Science and Engineering.
THE EFFECTS OF SEA WATER AND CONCENTRATED SALT SOLUTIONS ON THE FATIGUE OF NYLON 6,6 FIBERS
In its Fatigue of Syn. Fibers for Marine Rope Appl. Apr. 1984 34 p refs (For primary document see N85-28414 17-39)
Avail: NTIS HC A05/MF A01

Cyclic fatigue and creep rupture for high tenacity nylon 6,6 single fibers, yarns, and small ropes in air and sea water environments were tested. Fatigue failure in each case is by a creep rupture mechanism; yarns and small ropes show the same fatigue sensitivity as do single fibers. Sea water reduces the strength by approximately 10% under most conditions. Concentrated metallic salt solutions which cause environmental stress cracking in bulk nylon do not degrade the fibers beyond the effect of plain water. It is shown that environmental stress crack sensitivity is greatly reduced by orientation. E.A.K.

N85-28417# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
BIAXIAL BUCKLING OF SPECIALLY ORTHOTROPIC, SYMMETRIC COMPOSITE RECTANGULAR PLATES M.S. Thesis
J. P. McFadden Dec. 1984 212 p
(AD-A152958; AFIT/GAE/AA/84D-15) Avail: NTIS HC A10/MF A01 CSCL 20/11

The biaxial plate buckling problem for specially orthotropic, symmetric laminates is transformed from Cartesian to doubly affine space. Setting the starred bending stiffness ratio D (which ranges from zero to one) to the null value enables ready and very accurate solution of the buckling problem. Seven sets of boundary restraint configurations are examined, and corresponding buckling surfaces are presented. The character of these results vary widely between the strongest and weakest sets of support conditions. In order to prevent buckling for the weakest conditions, considerable tension must be provided on parallel edges for just small amounts of compression applied on the opposite set of edges. GRA

N85-28418# Drexel Univ., Philadelphia, Pa.
INVESTIGATIONS OF THE MATERIAL FACTORS IN THE ADIABATIC SHEARING OF STEELS Final Report, 1 Jul. 1981 - 30 Sep. 1984
H. C. Rogers 15 Feb. 1985 13 p
(Contract DAAG29-81-K-0048)
(AD-A153084; ARO-17887.1-MS) Avail: NTIS HC A02/MF A01 CSCL 20/11

The goal of the program was the further define the materials factors controlling the susceptibility of steels to adiabatic shear strain localization. A variety of steels were impacted with projectiles having a flat-bottomed cylindrical step on the impacting end. The materials examined included: Armco Iron, Ti-gettered high purity iron, AISI 1018, AISI 1040, 2 1/4 Cr-1 Mo chemical reactor steel, a dual phase steel, H26 Tool steel, Hadfield's austenitic manganese steel, 304 and 310 stainless steels. GRA

N85-28419# Northwestern Univ., Evanston, Ill. Dept. of Civil Engineering.

INTERACTION AMONG INHOMOGENEITIES AND INCLUSIONS Final Report, 7 Jun. 1981 - 30 Nov. 1984
T. Mura 22 Jan. 1985 10 p
(Contract DAAG29-81-K-0090)
(AD-A153114; ARO-17758.28-EG) Avail: NTIS HC A02/MF A01 CSCL 20/11

This document discusses research results in the following areas: Soundless Demolition; Mechanical Property of Composite Materials; Fatigue Crack Initiation and Propagation; Half-Space Problems; Sliding Inclusions; and Micromechanics of Defects in Solids. GRA

N85-28420# Brown Univ., Providence, R. I. Div. of Engineering.
CRITICAL CONDITIONS FOR FAILURE IN MATERIALS SUBJECTED TO HIGH RATES OF LOADING Final Report, 15 Aug. 1981 - 30 Nov. 1984
R. J. Clifton, R. J. Asaro, J. Duffy, L. E. Freund, and A. Needleman 20 Mar. 1985 39 p
(Contract DAAG29-81-K-0121)
(AD-A153135; ARC-18414.18-EG) Avail: NTIS HC/ A03/MF A01 CSCL 20/11

Mechanisms of the plastic deformation and failure of steels under dynamic loading conditions have been examined through investigations in three areas: dynamic plasticity shear bands, and fracture initiation. The dynamic plastic response of 4340 VAR steel has been measured in torsion experiments at strain rates from 10 to the minus 4th power minus 1 sec and inpressure-shear experiments at strain rates of 10 to the 5th power minus 1 sec. Torsion experiments were conducted at temperatures from -1900 to 23 C on three tempers (BBC 55,44,33). Relatively weak strain-rate sensitivity obtained in these experiments has been related to the high thermal stress barrier that must be overcome for plastic deformation at low temperatrures. Temperature profiles in the vicinity of the shear bands were measured using a ten-element, infrared detector system. Numerical simulations were used to assess the roles of strain hardening, strain-rate sensitivity, thermal softening and heat conduction on shear band formation. Finite element methods were developed for rate dependent plasticity and applied to calculations of failure through shear band propagation and ductile fracture. The effects of microstructure on dynamic and quasi-static fracture initiation of AISI 1020 steel were investigated by means of our notched-round bar experiment. The results cover the temperture range -150 C to 100 C. For static loading under ductile conditions the results are now being supplemented by a detailed study to determine the instant of fracture initiation. GRA

N85-28421# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
ANALYTICAL SHEAR BUCKLING INVESTIGATION OF CURVED COMPOSITE PANELS M.S. Thesis
J. K. McDaniel Dec. 1984 67 p
(AD-A153138; AFIT/GA/AA/84D-5) Avail: NTIS HC A04/MF A01 CSCL 12/1

This numerical investigation parametrically determined how material and geometric properties affect the buckling load capability of 8-ply curved composite panels loaded under pure shear. The linear bifurcation capabilities of the STAGSC-1 finite element computer code developed by the Lockhead Palo Alto Research Laboratory was employed. Results from this computer code were compared with other published analytical results of similar configuration to verify boundary conditions. Representative material properties for both graphite-epoxy and Kevlar-epoxy were used. The aspect ratios of 0.5, 1.0, and 2.0 was achieved by varying the axial length of the cylindrical panel. Both quasi-isotropic and symmetric orthotropic fiber orientations were analyzed. Results indicate that these curved composite panels, while loaded with a shear load resulting in pure shear reactions in flat plates, do not react in pure shear. Once the interior force resultants are established, the load carrying capability of the curved panels follow classical laminated plate theory. GRA

N85-28422# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
EVALUATION OF INTERPOLATIVE MODELING CONCEPTS FOR FATIGUE CRACK GROWTH AT ELEVATED TEMPERATURE M.S. Thesis
G. O. Painter Dec. 1984 79 p
(AD-A153222; AFIT/GAE/AA/84D-20) Avail: NTIS HC A05/MF A01 CSCL 20/11

This thesis presents an examination of interpolative schemes for fatigue crack growth at elevated temperature (1200 F). An interpolative scheme involving the linear superposition of effects due to stress ratio, loading frequency, and peak load dwell or hold time, is applied to two state-of-the-art crack growth rate prediction models. The SINH model is based on the hyperbolic sine function, and MSE model is based on a sigmoidal equation. The results of an experimental program are presented. Fatigue crack growth rate tests are performed on compact tension specimens according to ASTM standards. Two interpolative models are developed from the resulting data base. Additional tests are performed and the model predictions are compared to these additional tests. It is found that linear (on log-log scale) functional forms can be assumed to relate model constants to the test parameters (load ratio, frequency, and hold time). It is found that these functional forms can be applied to both models. More work is needed to determine whether the effects of variations in each of the test parameters on crack growth rate are independent of each other and can be linearly superimposed. When the same functional forms are applied to the SINH and the MSE models, they behave much alike. GRA

N85-28423# Naval Postgraduate School, Monterey, Calif.
FIRST PASSAGE TIMES FOR COMBINATIONS OF RANDOM LOADS
P. A. Jacobs Feb. 1985 43 p
(Grant NSF ECS-82-16852; NR Proj. RR0-1405)
(AD-A153275; NPS55-85-002) Avail: NTIS HC A03/MF A01 CSCL 20/11

Structures are subject to changing loads from various sources. In many instances these loads fluctuate in time, apparently in random fashion. Models are considered for which the stress put on the structure by various loads simultaneously can be described by a regenerative process. The distribution of the first time until the stress on the structure exceeds a given level x is studied. Asymptotic properties of the distribution are given for a large stress level x and for the tail of the distribution for fixed finite stress level x. Simulation results are given to assess the accuracy of using the asymptotic results to approximate the distribution. GRA

N85-28424# Army Armament Research and Development Command, Watervliet, N. Y. Large Caliber Weapon Systems Lab.
CYCLIC TORSION OF A CIRCULAR CYLINDER AND ITS RESIDUAL STRESS DISTRIBUTION Final Report
H. C. Wu, M. R. Aboutorabi, and P. C. T. Chen Feb. 1985 29 p
(AD-A153347; AD-E440274; ARLCB-TR-85006) Avail: NTIS HC A03/MF A01 CSCL 20/11

The endochronic theory of plasticity is applied to discuss the cyclic fully-reversed torsional loading of a solid bar with circular cross-section. Numerical techniques are employed to obtain the solution. The parameters of the constitutive equations are determined from the test data of thin-walled specimens. These parameters are then used without alteration to compute stress distributions within the solid specimen. Special attention is given to the residual stress distribution. It is shown that reasonable results are obtained. The relation of torque versus strain at the outermost fiber of the solid specimen provides an ultimate check of the theory as applied to this case. GRA

N85-28425# Argonne National Lab., Ill.
DOE/ANL/HTRI HEAT EXCHANGER TUBE VIBRATION DATA BANK: ADDENDUM 5
H. Halle, J. M. Chenoweth, and M. W. Wambsganss Jan. 1985 33 p refs

(Contract W-31-109-eng-38)
(DE85-007730; ANL-CT-80-3-Add-5) Avail: NTIS HC A03/MF A01

This fifth addendum to the DOE/ANL/HTRI Heat Exchanger Tube Vibration Data Bank presents six new case histories of field experiences. The data bank was established in 1980 to accumulate comprehensive case histories on heat exchanters that have experienced tube-vibration problems and on units that have been trouble-free, and to render this information available for evaluation, improvement, and development of vibration-prediction methods and design guidelines. DOE

N85-28426# Massachusetts Inst. of Tech., Cambridge.
INFLUENCE OF MATERIALS CREEP ON ROTOR DYNAMICS
Stephen H. Crandall Jan. 1985 28 p refs
(Contract DE-AC05-76CR-01779)
(DE85-008545; UVA-ER-966-85-U) Avail: NTIS HC A03/MF A01

A simplified model of a single whirling mode was used to show that slow rotor creep has a slight destabilizing effect on forward whirls when the rotor rotates supercritically and that the amplitude of the forced synchronous whirl can grow without limit under steady rotation at certain subcritical rotation rates. An elastic rotor system is described. A standard three element viscoelastic model and a power law creep model were studied. Results for the two creep models are compared. The long time effects of creep may be interpreted as causing a wandering unbalance. DOE

N85-28427# General Atomic Co., San Diego, Calif.
FATIGUE STRENGTH OF INCONEL 625 PLATE AND WELDMENTS USED IN THE DIII-D CONFIGURATION VACUUM VESSEL
P. W. Trester, J. I. Kaae, and R. Gallix Dec. 1984 13 p refs Presented at the 1st Intern. Conf. on Fusion Reactor Mater., Tokyo, 3 Dec. 1984
(Contract DE-AT03-84ER-51044)
(DE85-008276; GA-A-17791; CONF-841246-23) Avail: NTIS HC A02/MF A01

The Doublet III-D vacuum vessel enables fusion experiments with large dee-configuration plasmas in the Tokamak device. The vessel is a welded structure of Ni-Cr-Mo-Nb alloy Inconel 625, in the forms of mill annealed plate and sheet. An emphasis was placed on specifying material with small grain size to enhance fatigue resistance. Fatigue strength was determined by tension compression axial strain cycling of specimens excised from stock plate 25 mm thick. In addition, tests were conducted on gas-tungsten-arc weldments. The strain ranges and the resulting alternating, which produced fatigue lives between 10(3) and 10(6) cycles, were determined in the test program. Comparisons are presented with published data obtained using the rotating beam test method. A discussion is also presented on the effect of the grain size on fatigue strength. DOE

N85-28428# Technische Hogeschool, Delft (Netherlands). Dept. of Mathematics and Informatics.
ON THE WIND-INDUCED VIBRATIONS OF A MASS-SPRING SYSTEM
A. H. P. vanderBurgh 1984 15 p refs Presented at Journees Anal. Non Lineaire Lecture on Some Probl. in the Asymptotic Theory of Aero-Elasticity, Lille, 17-19 May 1983
(Rept-84-04) Avail: NTIS HC A02/MF A01

The dynamics of a simple elastic structure in a uniform wind field is studied. A nonlinear theory including a starting and limiting mechanism is introduced for systems with one and two degrees of freedom. In the one degree of freedom approach a generalized Van der Pol equation is used. In the two degrees of freedom approach a quadratic system may be used to describe the wind-induced vibrations. The equations of motion are analyzed by the averaging method. Author (ESA)

N85-28429# Technische Hogeschool, Delft (Netherlands). Dept. of Aerospace Engineering.
INITIAL IMPERFECTION SURVEYS ON CONICAL SHELLS AT HOECHST AG
J. Arbocz and A. W. H. Klompe Dec. 1983 51 p refs
(VTH-LR-407) Avail: NTIS HC A04/MF A01

Stability tests were carried out to study initial imperfections of water filled steel and composite cones. Since the composite cones are carefully wrapped around precision machined mandrels they exhibit much smaller initial imperfections than the metal cones, which are made by wrapping plates around mandrels and then assembling the component parts by welded seams. When comparing the large initial imperfections observed on the metal test specimens (peak to peak deviations of 5 or more wall thicknesses) with the excellent craftmanship achieved on the real structures, the question arises whether the knock-down factors due to initial imperfections observed during the tests can be considered representative of the real structure. Author (ESA)

N85-28430# National Aerospace Lab., Amsterdam (Netherlands). Structures and Materials Dept.
ENGINEERING SIGNIFICANCE OF FATIGUE THRESHOLDS AND SHORT FATIGUE CRACKS FOR STRUCTURAL DESIGN
R. J. H. Wanhill 1 Feb. 1984 15 p refs Presented at 2nd Intern. Conf. on Fatigue and Fatigue Thresholds, Birmingham, England, Sep. 1984
(NLR-MP-84001-U; B8561153) Avail: NTIS HC A02/MF A01

The significance of fatigue thresholds and short fatigue cracks for engineering structures with respect to design philosophy (safety and durability, the anticipated service loads and nondestructive inspection (NDI)) are examined. Examples for spacecraft payloads, aircraft structures (including landing gear and jet engines), offshore and littoral structures, thick-walled pressure vessels, wind turbines, power generating equipment and ship propellers are given. Author (ESA)

N85-28431# National Aerospace Lab., Amsterdam (Netherlands). Structures and Materials Div.
FRANGIBILITY OF OBSTACLES AT AIRPORTS
J. F. M. Wiggenraad 30 Jan. 1984 14 p refs Presented at Intern. Conf. and Exposition on Struct. Impact and Crashworthiness, London, 16-20 Jul. 1984
(NLR-MP-84002-U; B8561154) Avail: NTIS HC A02/MF A01

The idea that design requirements for the frangibility of obstacles at airports can be developed if empirical relations can be established between the damage to aircraft resulting from a collision and the energy necessary to disconnect (part of) the obstacle and to subsequently accelerate it is discussed. This approach is analogous to a procedure followed with success in the case of bird impacts. A modular structure with easily breakable joints and low fragment mass is advocated. Author (ESA)

N85-28432# National Aerospace Lab., Amsterdam (Netherlands). Structures and Materials Div.
RESEARCH ON STRUCTURES AND MATERIALS
1983 40 p refs Sponsored by Netherlands Agency for Aerospace Programs Original contains color illustrations
(B8580080) Avail: NTIS HC A03/MF A01

Research on aircraft loads, structures, and materials is described. Fatigue load monitoring in service; fatigue life prediction under service loading conditions; analysis of fatigue crack propagation, and development of standardized fatigue load spectra are discussed. Buckling and post-buckling behavior of stiffened structures; deformations in crack tip zones; strength of cracked structures; and experimental deformation analysis are treated. Evaluation of advanced aluminum alloys; high temperature materials; composite materials; adhesive bonded joints; fracture; environmental fatigue; stress corrosion; and high temperature corrosion are summarized. Author (ESA)

N85-28433# Erlangen-Nuremberg Univ. (West Germany). Inst. fuer Werkstoffwissenschaften 1.
HIGH TEMPERATURE FRACTURE MECHANICS OF SILICON NITRIDE Final Report, Dec. 1982
Karl Kriz Bonn Bundesministerium fuer Forschung und Technologie Dec. 1984 77 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie

(BMFT-FB-T-84-285; ISSN-0340-7608) Avail: NTIS HC A05/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 16

Slow crack growth measurements were made at temperatures up to 1500 C with high pressure silicon nitride (HPSN) with MgO, Y2O3, and MgO+AlM as sintering aids. Below 800 C the slow crack growth in MgO-doped HPSN-grades is dominantly influenced by the corrosion attack of water molecules on the grain boundary phase. The Y2O3-doped grade shows no such effect and breaks up to 1200 C transcrystalline. Above 800 C local softening of the grain boundary phase increasingly influences the fracture behavior of all investigated HPSN-grades, even with the higher viscosity of the Y2O3 containing phase. It is suggested that the fracture behavior is increasingly influenced by the formation of a process zone near the crack tip. Grain boundary sliding and secondary cracking in this zone lead first to rising crack resistance before the decreasing viscosity of the grain boundary phase overcompensates these effects. In this range the fracture mechanism is similar for all investigated HPSN-grades and depends on the crack growth rate. Author (ESA)

N85-28434# GKSS-Forschungszentrum Geesthacht (West Germany). Inst. fuer Anlagentechnik.
FIELD THEORY ANALYSIS USING THE FINITE ELEMENT METHOD TO DETERMINE THE DELIBERATION CURVES OF THREE DIMENSIONAL FRACTURE MECHANICS SPECIMENS WITH A SEMICIRCULAR SURFACE CRACK APPLYING THE ELECTRICAL DIRECT CURRENT POTENTIAL METHOD FOR CRACK DEPTH MEASUREMENT [FELDTHEORETISCHE FINITE-ELEMENT-ANALYSE ZUR ERMITTLUNG DER EICHKURVE FUER EINE DREIDIMENSIONALE BRUCHMECHANIKPROBE MIT HALBKREISFOERMIGEM OBERFLAECHENRISS ZUR ANWENDUNG DER ELEKTRISCHEN GLEICHSTROMPOTENTIAL-METHODE ZUR RISSTIEFENMESSUNG]
R. Dietrich 1984 32 p refs In GERMAN; ENGLISH summary (GKSS-84/E/53; ISSN-0344-9629) Avail: NTIS HC A03/MF A01

The finite element method is utilized to provide theoretical calibration curves for the electrical direct-current potential crack-monitoring system as applied to a three-dimensional fracture mechanics specimen with surface crack. The basic concepts of the finite element method are explained. Comparison with calibration curves for such test piece geometries derived using experimental procedures confirm the accuracy of the method. Author (ESA)

N85-27952*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
OVERVIEW OF STRUCTURAL RESPONSE: PROBABILISTIC STRUCTURAL ANALYSIS Abstract Only
Christos C. Chamis *In its* Struct. Integrity and Durability of Reusable Space Propulsion Systems May 1985 p 63-66 (For primary document see N85-27941 17-20)
Avail: NTIS HC A09/MF A01 CSCL 20K

N85-27953*# Rockwell International Corp., Canoga Park, Calif.
COMPOSITE LOADS SPECTRA FOR SELECT SPACE PROPULSION STRUCTURAL COMPONENTS Abstract Only
J. F. Newell *In* NASA. Lewis Research Center Struct. Integrity and Durability of Reusable Space Propulsion Systems May 1985 p 67-75 (For primary document see N85-27941 17-20)
(Contract NAS3-24382)
Avail: NTIS HC A09/MF A01 CSCL 20K

N85-27954*# Battelle Columbus Labs., Ohio.
COMPOSITE LOADS SPECTRA FOR SELECT SPACE PROPULSION STRUCTURAL COMPONENTS: PROBABILISTIC LOAD MODEL DEVELOPMENT Abstract Only
Robert Kurth *In* NASA. Lewis Research Center Struct. Integrity and Durability of Reusable Space Propulsion Systems May 1985 p 77-83 (For primary document see N85-27941 17-20)
(Contract NAS3-24382)
Avail: NTIS HC A09/MF A01 CSCL 20K

N85-27955*# Southwest Research Inst., San Antonio, Tex.
PROBABILISTIC STRUCTURAL ANALYSIS THEORY DEVELOPMENT Abstract Only
O. H. Burnside *In* NASA. Lewis Research Center Struct. Integrity and Durability of Reusable Space Propulsion Systems May 1985 p 85-92 (For primary document see N85-27941 17-20)
(Contract NAS3-24389)
Avail: NTIS HC A09/MF A01 CSCL 20K

N85-27956*# MARC Analysis Research Corp., Palo Alto, Calif.
PROBABILISTIC FINITE ELEMENT DEVELOPMENT Abstract Only
Jop Nagtegaal *In* NASA. Lewis Research Center Struct. Integrity and Durability of Reusable Space Propulsion Systems May 1985 p 93-98 (For primary document see N85-27941 17-20)
(Contract NAS3-24389)
Avail: NTIS HC A09/MF A01 CSCL 20K

N85-27957*# Northwestern Univ., Evanston, Ill.
PROBABILISTIC FINITE ELEMENT: VARIATIONAL THEORY Abstract Only
T. Belytschko and Wing Kam Liu *In* NASA. Lewis Research Center Struct. Integrity and Durability of Reusable Propulsion Systems May 1985 p 99-107 (For primary document see N85-27941 17-20)
(Grant NAG3-535)
Avail: NTIS HC A09/MF A01 CSCL 20K

N85-27958*# Sverdrup Technology, Inc., Middleburg Heights, Ohio.
PROBABILISTIC STRUCTURAL ANALYSIS OF SSME TURBOPUMP BLADES: PROBABILISTIC GEOMETRY EFFECTS Abstract Only
Vinod K. Nagpal *In* NASA. Lewis Research Center Struct. Integrity and Durability of Reusable Propulsion Systems May 1985 p 109-115 (For primary document see N85-27941 17-20)
Avail: NTIS HC A09/MF A01 CSCL 20K

N85-27959*# Georgia Inst. of Tech., Atlanta.
DYNAMIC CREEP BUCKLING: ANALYSIS OF SHELL STRUCTURES SUBJECTED TO TIME-DEPENDENT MECHANICAL AND THERMAL LOADING Abstract Only
G. J. Simitses, R. L. Carlson, and R. Riff *In* NASA. Lewis Research Center Struct. Integrity and Durability of Reusable Space Propulsion Systems May 1985 p 117-120 (For primary document see N85-27941 17-20)
(Grant NAG3-534)
Avail: NTIS HC A09/MF A01 CSCL 20K

N85-27960*# Sverdrup Technology, Inc., Middleburg Heights, Ohio.
STRUCTURAL TAILORING OF SSME BLADES (VANES) Abstract Only
R. Rubinstein *In* NASA. Lewis Research Center Struct. Integrity and Durability of Reusable Space Propulsion Systems May 1985 p 121-125 (For primary document see N85-27941 17-20)
Avail: NTIS HC A09/MF A01 CSCL 20K

N85-27961*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
INTERACTION OF HIGH-CYCLE AND LOW-CYCLE FATIGUE OF HAYNES 188 ALLOY AT 1400 F DEG Abstract Only
Peter T. Bizon, Dan J. Thoma, and Gary R. Halford *In its* Struct. Integrity and Durability of Reusable Space Propulsion Systems May 1985 p 129-138 (For primary document see N85-27941 17-20)
Avail: NTIS HC A09/MF A01 CSCL 20K

N85-27962*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
REEXAMINATION OF CUMULATIVE FATIGUE DAMAGE LAWS Abstract Only
Gary R. Halford and S. S. Manson (Case Western Reserve Univ.) *In its* Struct. Integrity and Durability of Reusable Space Propulsion

Systems May 1985 p 139-145 refs (For primary document see N85-27941 17-20)
Avail: NTIS HC A09/MF A01 CSCL 20K

N85-27963*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
CYCLIC STRUCTURAL ANALYSES OF SSME TURBINE BLADES
Albert Kaufman and Jane M. Manderscheid *In its* Struct. Integrity and Durability of Reusable Space Propulsion Systems May 1985 p 147-154 refs (For primary document see N85-27941 17-20)
Avail: NTIS HC A09/MF A01 CSCL 20K

N85-27964*# Argonne National Lab., Ill.
EFFECTS OF HIGH MEAN STRESS ON HIGH-CYCLE FATIGUE BEHAVIOR OF PWA 1480 Abstract Only
Saurin Majumdar, S. D. Antolovich (Georgia Inst. of Tech.), and Walter W. Milligan (Georgia Inst. of Tech.) *In* NASA. Lewis Research Center Struct. Integrity and Durability of Reusable Space Propulsion Systems May 1985 p 155-162 ref Sponsored in part by NASA (For primary document see N85-27941 17-20)
Avail: NTIS HC A09/MF A01 CSCL 20K

N85-28163# Joint Publications Research Service, Arlington, Va.
ELASTIC EQUILIBRIUM OF COMPOSITE SHELLS WITH FINITE SHEAR RIGIDITY Abstract Only
Ya. M. Grigorenko, I. S. Mukha, Ya. G. Savula, and N. P. Fleyshman *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-85-004) 15 May 1985 p 86 Transl. into ENGLISH from Dokl. Akad. Nauk Ukr. SSR: Ser. a Fiz.-Mat. i Tekhn. Nauki (Kiev), no. 7, Jul. 1984 p 33-36 Original language document was announced in IAA as A84-48022 (For primary document see N85-28142 17-31)
Avail: NTIS HC A06/MF A01

N85-28164# Joint Publications Research Service, Arlington, Va.
STABILITY OF CYLINDRICAL SHELLS WITH VARIABLE THICKNESS UNDER EXTERNAL PRESSURE Abstract Only
V. V. Kabanov and L. P. Zheleznov *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-85-004) 15 May 1985 p 86-87 Transl. into ENGLISH from Prikl. Mekhan. (Kiev), v. 20, no. 7, Jul. 1984 p 53-59 Original language document was announced in IAA as A84-45794 (For primary document see N85-28142 17-31)
Avail: NTIS HC A06/MF A01

N85-28165# Joint Publications Research Service, Arlington, Va.
NATURAL VIBRATIONS OF REINFORCED SPHERICAL SHELLS Abstract Only
V. N. Revutskiy *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-85-004) 15 May 1985 p 87 Transl. into ENGLISH from Prikl. Mekhan. (Kiev), v. 20, no. 7, Jul. 1984 p 87 (For primary document see N85-28142 17-31)
Avail: NTIS HC A06/MF A01

N85-28166# Joint Publications Research Service, Arlington, Va.
NUMERICAL SOLUTION OF ONE-DIMENSIONAL NONLINEAR PROBLEMS OF STATICS FOR ELASTIC BEAMS AND SHELLS UNDER RIGID CONSTRAINTS Abstract Only
S. A. Kabrits and V. P. Terentyev *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-85-004) 15 May 1985 p 88 Transl. into ENGLISH from Prikl. Mekhan. (Kiev), v. 20, no. 7, Jul. 1984 p 96-100 (For primary document see N85-28142 17-31)
Avail: NTIS HC A06/MF A01

N85-28167# Joint Publications Research Service, Arlington, Va.
METHOD OF SOLVING PROBLEMS OF STATICS FOR MULTILAYER SHELLS OF REVOLUTION Abstract Only
B. G. Popov and E. V. Raman *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-85-004) 15 May 1985 p 89 Transl. into ENGLISH from Prikl. Mekhan. (Kiev), v. 20, no. 7, Jul. 1984 p 59-65 Original language document was announced in IAA as A84-45795 (For primary document see N85-28142 17-31)
Avail: NTIS HC A06/MF A01

N85-28169# Joint Publications Research Service, Arlington, Va.
PROPAGATION OF NON-AXISYMMETRIC ELASTIC WAVES THROUGH SHELL WITH FILLER UNDER RADIAL LOAD AT ONE END Abstract Only
Yu. V. Mastinovskiy and Yu. I. Nagornyy *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-85-004) 15 May 1985 p 90-91 Transl. into ENGLISH from Prikl. Mekhan. (Kiev), v. 20, no. 7, Jul. 1984 p 104-107 (For primary document see N85-28142 17-31)
Avail: NTIS HC A06/MF A01

42 GEOSCIENCES (GENERAL)

No abstracts in this category.

43 EARTH RESOURCES

Includes remote sensing of earth resources by aircraft and spacecraft; photogrammetry; and aerial photography.

For instrumentation see *35 Instrumentation and Photography.*

N85-28435 Metals Society, London (England).
WORLD IRON ORE RESERVES
A. Pospiech Dec. 1984 7 p refs Transl. into ENGLISH from Hutnik (Katowice, Poland), no. 9, 1982 p 132-134
(BLL-BISI-Trans-22280-(9022.06)) Avail: British Library Lending Div., Boston Spa, Engl.: UK £14.25; Overseas $33.75

Figures for world iron ore reserves are discussed in relation to the Iron and Steel Industry in the COMECON Countries. Author

N85-28436# Michigan State Univ., East Lansing.
AIRPHOTO INTERPRETATION OF VEGETATION AND LANDFORMS FOR SOIL MAPPING
9 Nov. 1984 127 p refs Presented at the Soil Sci. Workshop, Higgins Lake, Mich., 5-9 Nov. 1984
Avail: NTIS HC A07/MF A01

Various aspects of the interpretation of aerial photographs of vegetation and landform for soil mapping are discussed. Photographic sensors, stereo-viewing, photometric size determination color infrared photography and color infrared films are among the topics covered. R.J.F.

N85-28437# Defense Mapping Agency Aerospace Center, St. Louis, Mo.
EVALUATION OF DEFENSE MAPPING AGENCY LEVEL 1 SECOND EDITION DIGITAL DATA FOR TRAINING SIMULATOR APPLICATIONS
G. A. Gutowski, A. Stys, D. Petry, and R. Pierce Feb. 1985 12 p (AD-A152444) Avail: NTIS HC A02/MF A01 CSCL 08/2

The Defense Mapping Agency (DMA) produces digital data bases for the DoD which are used by many systems developed for the generation of real-world simulation data. In the past, Level 1 (First Edition) Digital Landmass System (DLMS) data has been used to support visual and sensor simulation systems. This First Edition DLMS data was intended for radar simulation systems and required some enhancements by users to support these other types of simulations. Simulations of advanced systems require higher resolution data than that supplied by First Edition DLMS data. DMA has developed Level 1 Second Edition DLMS data, and is producing this data in limited quantities over selected areas, to meet the expanding demands of the simulation community. This data contains new feature types from expanded First Edition DLMS data classifications. It provides an increase in continuity of real-world information over First Edition DLMS data. This correlates to more effective sensory queues in a simulation environment. In conjunction with DMA, the General Electric Company has per-

formed an evaluation of Second Edition DLMS data. It includes an examination and analysis of two Second Edition DLMS data sets produced by DMA. Corresponding First Edition DLMS data sets were supplied and used for a comparison study. A dynamic real-time visual system simulation was produced from these data sets. This paper presents the results of this evaluation, with emphasis on the dynamic visual demonstration. GRA

N85-28438# Naval Postgraduate School, Monterey, Calif.
AN ASSESSMENT OF THE POTENTIAL ROLE OF MULTISPECTRAL IMAGERY IN BATHYMETRIC CHARTING M.S. Thesis
R. T. Joy Sep. 1984 98 p
(AD-A152460) Avail: NTIS HC A05/MF A01 CSCL 08/10

Previous research has demonstrated the feasibility of deriving water depth information from LANDSAT Multispectral Scanner (MSS) digital data. However, previously published results, analysed together with two new case studies, show that the magnitude of errors (approximately 1-2 meters) in MSS singleband depth extimates is too large for direct production of bathymetric charts. Better accuracy is possible, though, if MSS data are used to interpolate conventional soundings between survey tracklines, especially if the survey vessels obtain concurrent optical ground truth data. If depth accuracy standards can be met, the MSS interpolation approach will be extremely cost effective. In addition, MSS imagery is shown to be a useful tool for planning and managing conventional surveys. A recommended set of procedures is outlined for incorporating MSS image data into an operational bathymetric mapping program. A comprehensive program of development and operational demonstration surveys is recommended to convincingly establish the utility and cost effectiveness of these procedures. GRA

N85-28439# Decilog, Inc., Melville, N. Y.
SYSTEM ANALYSIS OF A FIELD ARMY TOPOGRAPHIC SUPPORT SYSTEM Final Report, May 1982 - Dec. 1984
A. A. Gold, C. T. Goldsmith, and V. E. Sellers 1 Feb. 1985 46 p
(Contract DAAK70-82-C-0095)
(AD-A153318; DECILOG-0266; ETL-0390) Avail: NTIS HC A03/MF A01 CSCL 05/1

In 1978, Decilog completed a Computer Simulation Model of the Topographic Support System (TSS) under Contract for the Engineer Topographic Laboratories (ETL). As a result of exercising that Model, it was possible to conclude that the TSS, as configured by an interagency Integrated Equipment Evaluation Team, was capable of producing the required Products and Services in a manner of which was then considered timely. With the passage of time, however, there were changes in the TSS design and environment. The 1978 model was restricted to a particular scenario. One major objective of this effort was to Revise the Simulation Model to simplify input and add additional features to enhance flexibility. ETLSIM has already been used to support two management decisions. The first was a problem concerning the effect of the introduction of the Quick Response Multicolor Printer (QRMP), and the second was a problem concerning design specifications for the QRMP itself. The use of ETLSIM in both cases provided the appropriate quantitative data necessary to rapidly resolve these conflicts. GRA

N85-28440# National Aerospace Lab., Amsterdam (Netherlands). Space Div.
EARTH OBSERVATION MODELING BASED ON LAYER SCATTERING MATRICES
W. Verhoef 21 Feb. 1984 25 p refs Previously announced in IAA as A85-30091 Submitted for publication
(NLR-MP-84015-U; B8561058) Avail: NTIS HC A02/MF A01

The differential equations describing radiative transfer in vegetation canopies in the Suits model are generalized and solved to derive a layer scattering matrix. Layer scattering matrices can be applied to the calculation of optical parameters for multilayer ensembles according to the Adding method. The application to atmospheric scattering is demonstrated by explaining path radiance, sky radiance, and other quantities in terms of elements from a layer scattering matrix and a surface reflectance matrix. By combining scattering matrices originating from atmospheric layers with those from Earth objects, Earth observation models can be constructed. Author (ESA)

N85-28441# National Aerospace Lab., Amsterdam (Netherlands).
DEVELOPMENTS IN REMOTE SENSING
1983 12 p In DUTCH; ENGLISH summary Sponsored by Netherland Agency for Aerospace Programs Original contains color illustrations
(B8580069) Avail: NTIS HC A02/MF A01

The processing of thermal-infrared remote sensing data from data aircraft and satellites is described. The analog data are, after a analog-to-digital conversion, checked and selected by a video quick-look system. After correction for systematic errors they are presented as pictures showing the surface temperature differences on a color TV in which a variable color coding is used. Author (ESA)

N85-28442# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Oberpfaffenhofen (West Germany). Abt. Infrarottechnik.
COMPARISON OF MEASUREMENT AND SIMULATION RESULTS OF RADIATION TEMPERATURES APPLIED TO THE THERMAL MAPPING OF MUNICH
Rudolf Richter and Kurt Beier Dec. 1984 81 p refs In GERMAN; ENGLISH summary
(DFVLR-FB-85-06; ISSN-0171-1342) Avail: NTIS HC A05/MF A01; DFVLR, Cologne DM 24.50

The radiation temperatures of selected ground targets measured in the 8 to 13 micron spectral range at different seasons and times of day are compared with the results of the SENSAT simulation model. The deviations are < 1 K. Systematic errors of the scanner from 1 to 2 K are recognised for winter flights because of lack of scanner calibrations under winter conditions. The results confirm the validity of the simulation model. Author (ESA)

44 ENERGY PRODUCTION AND CONVERSION

Includes specific energy conversion systems, e.g., fuel cells and batteries; global sources of energy; fossil fuels; geophysical conversion; hydroelectric power; and wind power.

For related information see also *07 Aircraft Propulsion and Power, 20 Spacecraft Propulsion and Power, 28 Propellants and Fuels,* and *85 Urban Technology and Transportation.*

N85-28443 Depart of the Air Force, Washington, D.C.
APPARATUS FOI CHING VERTICAL JUNCTION SOLAR CELL WAFERS Patent
C. R. Valley, inventor (to Air Force) Issued 26 Feb. 1985 3 p Supersedes AD-D010861
(AD-D011653; US-Patent-4,501,636; US-Patent-Appl-SN-566444; US-Patent-Class-156-345) Avail: US Patent and Trademark Office CSCL 10/2

An apparatus for etching semiconductor wafers which comprises a cylindrical vessel with a lid having associated cooling means, a basket assembly, rack means for holding a plurality of wafers, support means for supporting the basket assembly above the bottom of the vessel, and stirring means. Author (GRA)

N85-28444*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
INITIAL PERFORMANCE OF ADVANCED DESIGNS FOR IPV NICKEL-HYDROGEN CELLS
John J. Smithrick 23 Aug. 1985 11 p refs Presented at 20th Intersoc. Energy Conversion Eng. Conf. (IECEC), Miami Beach, Fla., 18-23 Aug. 1985; sponsored by SAE, ANS, ASME, IEEE,

AIAA, ACS and American Institute of Chemical Engineers
(NASA-TM-87029; E-2585; NAS 1.15:87029) Avail: NTIS HC A02/MF A01 CSCL 10C

Advanced designs for individual pressure vessel nickel hydrogen cells were conceived which should improve the life cycle at deep depths of discharge and improve thermal management. Features of the designs which are new and not incorporated in either of the contemporary cells (Air Force/Hughes, Comsat) are: (1) the use of alternate methods of oxygen recombination, (2) use of serrated edge separators to facilitate movement of gas within the cell while still maintaining required physical contact with the wall wick, and (3) use of an expandable stack to accommodate some of the nickel electrode expansion. The designs also consider electrolyte volume requirements over the life of the cells, and are fully compatible with the Air Force/Hughes design. R.J.F.

N85-28445*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
ACTIVITY AND ACCOMPLISHMENTS OF DISH/STIRLING ELECTRIC POWER SYSTEM DEVELOPMENT
F. R. Livingston 15 Feb. 1985 147 p refs
(Contracts NAS7-918; DE-AM04-80AL-13137)
(NASA-CR-175841; DOE/JPL-1060-82; JPL-5105-150; JPL-Pub-85-8; NAS 1.26:175841) Avail: NTIS HC A07/MF A01 CSCL 10A

The development of the solar parabolic-dish/Stirling-engine electricity generating plant known as the dish/Stirling electric power system is described. The dish/Stirling electric power system converts sunlight to electricity more efficiently than any known existing solar electric power system. The fabrication and characterization of the test bed concentrators that were used for Stirling module testing and of the development of parabolic dish concentrator No. 2, an advanced solar concentrator unit considered for use with the Stirling power conversion unit is discussed. E.A.K.

N85-28446*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
RELATIVE POTENTIALS OF CONCENTRATING AND TWO-AXIS TRACKING FLAT-PLATE PHOTOVOLTAIC ARRAYS FOR CENTRAL-STATION APPLICATIONS
Chester S. Borden and Diane L. Schwartz 31 Dec. 1984 96 p refs
(Contracts NAS7-918; DE-AI01-78CS-54209)
(NASA-CR-175889; DOE/ET-20356/22; JPL-5230-15; JPL-Pub-85-16; NAS 1.26:175889) Avail: NTIS HC A05/MF A01 CSCL 10A

The purpose of this study is to assess the relative economic potentials of concenrating and two-axis tracking flat-plate photovoltaic arrays for central-station applications in the mid-1990's. Specific objectives of this study are to provide information on concentrator photovoltaic collector probabilistic price and efficiency levels to illustrate critical areas of R&D for concentrator cells and collectors, and to compare concentrator and flat-plate PV price and efficiency alternatives for several locations, based on their implied costs of energy. To deal with the uncertainties surrounding research and development activities in general, a probabilistic assessment of commercially achievable concentrator photovoltaic collector efficiencies and prices (at the factory loading dock) is performed. The results of this projection of concentrator photovoltaic technology are then compared with a previous flat-plate module price analysis (performed early in 1983). To focus this analysis on specific collector alternatives and their implied energy costs for different locations, similar two-axis tracking designs are assumed for both concentrator and flat-plate options. B.W.

N85-28447*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
PARABOLIC DISH TEST SITE: HISTORY AND OPERATING EXPERIENCE
M. K. Selcuk, comp. 15 Feb. 1985 223 p refs
(Contracts ; NAS7-918; DE-AM04-80AL-13137)
(NASA-CR-175892; DOE/JPL-1060-84; JPL-5105-147; JPL-Pub-85-18; NAS 1.26:175892) Avail: NTIS HC A10/MF A01 CSCL 10A

The parabolic dish test site (PDTS) was established for testing point-focusing solar concentrator systems operating at temperatures approaching 1650 C. Among tests run were evaluation and performance characterization of parabolic dish concentrators, receivers, power conversion units, and solar/fossil-fuel hybrid systems. The PDTS was fully operational until its closure in June, 1984. The evolution of the test program, a chronological listing of the experiments run, and data summaries for most of the tests conducted are presented. E.A.K.

N85-28448*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
DOCUMENTS OF THE JPL PHOTOVOLTAICS PROGRAM ANALYSIS AND INTEGRATION CENTER: AN ANNOTATED BIBLIOGRAPHY
A. M. Pearson 1 Apr. 1985 18 p
(Contracts NAS7-918; DE-AI01-76ET-20356)
(NASA-CR-175873; JPL-5210-22; JPL-Pub-85-26; NAS 1.26:175873; DOE/ET-20356/24) Avail: NTIS HC A02/MF A01 CSCL 10A

A bibliography of internal and external documents produced by the Jet Propulsion Laboratory, based on the work performed by the Photovoltaics Program Analysis and Integration Center, is presented with annotations. As shown in the Table of Contents, the bibliography is divided into three subject areas: (1) Assessments, (2) Methdological Studies, and (3) Supporting Studies. Annotated abstracts are presented for 20 papers. Author

N85-28449*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
A PROGRAM FOR THE CALCULATION OF PARABOLOIDAL-DISH SOLAR THERMAL POWER PLANT PERFORMANCE
J. M. Bowyer, Jr. 15 Apr. 1985 53 p
(Contracts NAS7-918; DE-AI01-76ET-20356)
(NASA-CR-175874; DOE/JPL-1060-85; JPL-5105-159; JPL-Pub-85-36; NAS 1.26:175874) Avail: NTIS HC A04/MF A01 CSCL 10A

A program capable of calculating the design-point and quasi-steady-state annual performance of a paraboloidal-concentrator solar thermal power plant without energy storage was written for a programmable calculator equipped with suitable printer. The power plant may be located at any site for which a histogram of annual direct normal insolation is available. Inputs required by the program are aperture area and the design and annual efficiencies of the concentrator; the intercept factor and apparent efficiency of the power conversion subsystem and a polynomial representation of its normalized part-load efficiency; the efficiency of the electrical generator or alternator; the efficiency of the electric power conditioning and transport subsystem; and the fractional parasitic loses for the plant. Losses to auxiliaries associated with each individual module are to be deducted when the power conversion subsystem efficiencies are calculated. Outputs provided by the program are the system design efficiency, the annualized receiver efficiency, the annualized power conversion subsystem efficiency, total annual direct normal insolation received per unit area of concentrator aperture, and the system annual efficiency. R.J.F.

N85-28450# Naval Weapons Center, China Lake, Calif.
NAVY GEOTHERMAL PLAN
Dec. 1984 21 p
(AD-A152478; AD-E900438; NWC-TP-6612) Avail: NTIS HC A02/MF A01 CSCL 08/7

Domestic geothermal resources with the potential for decreasing fossil fuel use and energy costs exist at a significant number of Navy facilities. The Geothermal Plan is part of the Navy Energy R and D Program that will evaluate Navy sites and provide a technical, economic, and environmental base for subsequent resource use. One purpose of the Program will be to provide for the transition of R and D funded exploratory efforts into the resource development phase. GRA

N85-28451# Midwest Research Inst., Golden, Colo. Solar Energy Research Inst.
WIND ENERGY SYSTEMS: PROGRAM SUMMARY FOR FISCAL YEAR, 1983
Dec. 1984 127 p refs
(Contract DE-AC02-77CH-00178)
(DE85-002927; SERI/SP-271-2647) Avail: NTIS HC A07/MF A01

The review includes: (1) history of the program and its current research focus; (2) organization of the program and research responsibilities of participating laboratories and organizations; (3) elements of the program and their budgets; (4) achievements of the program to the end of fiscal year 1983; (5) summaries of major contracts and projects; and (6) major publications. DOE

N85-28452# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
ELECTRICAL RESEARCH ON SOLAR CELLS AND PHOTOVOLTAIC MATERIALS Quarterly Report
J. Orehotsky (Wilkes Coll.) 30 Nov. 1984 40 p refs
(Contract JPL-956766)
(NASA-CR-175897; NAS 1.26:175897; DE85-007417; DOE/NBM-5007417) Avail: NTIS HC A03/MF A01 CSCL 10A

A systematic study of the properties of various polymer pottant materials and of the electrochemical corrosion mechanisms of solar cell materials is required for advancing the technology of terrestrial photovoltaic modules. The specific areas of concern involve: electrical and ionic resistivity of various polymer pottant materials when subjected to temperature, humidity, and ultraviolet radiation; water absorption kinetics and water solubility limits in various pottant polymers at selected temperatures and humidities; and corrosion characterization of the various metallization systems used in solar cell construction. The work focused on: ion implantation and radiation damage effects in PVB and EVA; water absorption and desorption in EVA and PVB; and corrosion effects in solar cells. DOE

N85-28453# Brown Univ., Providence, R. I. Div. of Engineering.
SILICA PROBLEM IN THE DESIGN OF GEOTHERMAL POWER PLANTS
Ronald DiPippo Feb. 1985 30 p refs
(Contract DE-AC03-84SF-12197)
(DE85-008245; DOE/SAN-12197/2; TWOPHASE/2) Avail: NTIS HC A03/MF A01

The silica problem is examined from the perspective of the power plant designer to develop a procedure to enable a quick estimate to be made of the potential seriousness of the silica deposition problem for a wide variety of resources and for selected types of power plant. The method employs correlations for the equilibrium solubilities of quartz and amorphous silica and for the saturated liquid enthalpy and the latent heat of water substance. Single- and double-flash plants optimized for highest thermodynamic efficiency are considered. Binary-type plants are included generically without mention of cycle specifics. The results are presented both graphically and in tabular form, and the governing equations will be given in an easily-programmable form. DOE

N85-28454# Physical Sciences, Inc., Andover, Mass.
MOLTEN CARBONATE FUEL CELL PERFORMANCE MODEL UPDATE Final Report
G. Wilemski, N. H. Kemp, and A. Gelb Jan. 1985 266 p refs
(Contract DE-AC21-81FE-15078)
(DE85-003356; DOE/FE-15078/1742) Avail: NTIS HC A12/MF A01

Work performed to improve porous electrode and mass transfer models used in calculating the performance of molten carbonate fuel cells is described. Mathematical model development is addressed, as well as porous electrode modeling. Gas diffusion within electrode pores is treated. A method is developed for computing electrode performance that includes the effects of limited gas phase diffusion and finite electronic conductivity of the electrode. A heterogeneous film model is proposed as a representation of some anodes currently under development. The formation of vertical concentration gradients in the gas distribution channels is considered. An improved mass transfer scheme is developed in order to include the effect of this phenomenon on cell performance. Listings of the computer models developed and/or modified during this research are given. DOE

N85-28455# Institute of Gas Technology, Chicago, Ill.
HIGH TEMPERATURE COMPOSITE THERMAL STORAGE SYSTEMS
R. J. Petri, E. T. Ong, and M. Olszewski (ORNL) 1984 7 p refs Presented at the Intersociety Energy Conversion Eng. Conf., San Francisco, 19 Aug. 1984
(Contract DE-AC02-76ET-26218)
(DE85-005073; CONF-840804-55) Avail: NTIS HC A02/MF A01

An advanced, thermal energy storage subsystem is being developed which employs composite phase change materials (PCM)/sensible heat material media. This media/subsystem is amenable to high temperature thermal storage applications such as industrial reject/process heat recovery and utilization, off peak utility and solar thermal power system applications. The concept allows for direct contact heat exchange between the latent/sensible storage media and compatible working fluids. A number of potentially significant TES system performance and cost advantages are thereby offered over conventional molten salt latent heat based storage subsystems. DOE

N85-28456# California Univ., Livermore. Lawrence Livermore Lab.
ALUMINUM-AIR POWER CELL RESEARCH AND DEVELOPMENT Progress Report
John F. Cooper Dec. 1984 19 p refs
(Contract W-7405-eng-48)
(DE85-008117; UCRL-53536) Avail: NTIS HC A02/MF A01

The wedge-shaped design, of the aluminum-air battery being developed, is mechanically simple and capable of full anode utilization and rapid full or partial recharge. To maintain constant interelectrode separation and to collect anodic current, the cell uses tin-coated copper tracks mounted on removable cassettes. Under gravity feed, slabs of aluminum enter the cell at a continuous and constant rate and gradually assume the wedge shape as they dissolve. Voltage losses at this tin-aluminum junction are 7 mV at 2 kA/m(2). A second-generation wedge cell incorporates air and electrolyte manifolding into individually replaceable air-cathode cassettes. Prototype wedge cells of one design were operated simultaneously with a fluidized-bed crystallizer, which stabilized aluminate concentration and produced a granular aluminum-trihydroxide reaction product. Electrolyte was circulated between the cell and crystallizer, and a hydrocyclone was used to retain particles larger than 0.015 mm within the crystallizer. Air electrodes were tested over simulated vehicle drive systems that include a standby phase in cold, supersaturated electrolyte. DOE

N85-28457# Oak Ridge National Lab., Tenn. Engineering Technology Div.
SIMPLIFIED ANALYSIS OF STIRLING ENGINES AND HEAT PUMPS
N. C. J. Chen, F. P. Griffin, and C. D. West Mar. 1985 35 p refs
(Contract DE-AC05-84OR-21400)
(DE85-008753; ORNL/TM-9498) Avail: NTIS HC A03/MF A01

Stirling machines are well suited to a simplified analytical technique in which the major variables are represented by linear combinations of sinusoidal or harmonic functions. Previous analyses of this type have, however, been unable to take into account some important aspects of the behavior of real engines, including the effects of heat transfer within the cylinders, pressure drop in the heat exchangers, and leakage of gas from the working space. The new theory is able to treat the losses from these causes by representing the nonlinear terms responsible for the effects as a truncated Fourier series. The resulting analysis is mathematically accurate and, when implemented on a computer, from 10 to 100 times faster than a numerical solution to the same dif-

ferential equations. The theory also realistically represents the loss due to each one. DOE

N85-28458# Sandia Labs., Albuquerque, N. Mex.
FIELD TEST REPORT OF THE DEPARTMENT OF ENERGY'S 100-kW VERTICAL AXIS WIND TURBINE
R. O. Nellums Feb. 1985 61 p refs
(Contract DE-AC04-76DP-00789)
(DE85-008475; SAND-84-0941) Avail: NTIS HC A04/MF A01

Three second generation Darrieus type vertical axis wind turbines of approximately 120 kW capacity per unit were installed in 1980-1981. Through March 1984, over 9000 hours of operation had been accumulated, including 6600 hours of operation on the unit installed in Bushland, Texas. The turbines were heavily instrumented and have yielded a large amount of test data. Test results of this program, including aerodynamic, structural, drive train, and economic data are presented. Among the most favorable results were an aerodynamic peak performance coefficient of 0.41; fundamental structural integrity requiring few repairs and no major component replacements as of March 1984; and an average prototype fabrication cost of approximately $970 per peak kilowatt of output. A review of potential design improvements is presented. DOE

N85-28459# Acurex Corp., Mountain View, Calif.
DEVELOPMENT OF MASS-PRODUCIBLE LINE-FOCUS TRACKING CONCENTRATING SOLAR COLLECTORS. CATEGORY 2: CONTROL SYSTEMS Final Report
T. E. Hickman Aug. 1984 42 p refs
(DE85-007873; DOE/CS-30265/T5) Avail: NTIS HC A03/MF A01

The system design criteria and concept of a mass producible modular electronic control system for solar industrial process heating installations are discussed. The control system consists of: the master controller; the weather tower, including a solar tracking angle reference; and overtemperature switch, group control box, tracker/controller, and drive motor for each group of single axis tracking parabolic trough solar collectors. System automatic operation is outlined for unattended installations. The production approach and cost estimates, both based on a production rate of 5 million ft(2) of collector aperature per year, are discussed here. The potential for further development of the system is also presented. DOE

N85-28460# Sandia Labs., Albuquerque, N. Mex.
SHENANDOAH PARABOLIC DISH SOLAR COLLECTOR
G. S. Kinoshita Jan. 1985 105 p
(Contract DE-AC04-76DP-00789)
(DE85-008326; SAND-83-0583) Avail: NTIS HC A06/MF A01

The objectives of the Shenandoah, Georgia, Solar Total Energy System are to design, construct, test, and operate a solar energy system to obtain experience with large scale hardware systems for future applications. The initial design and testing activities conducted to select and develop a collector that would serve the need of such a solar total energy system are described. The parabolic dish was selected as the collector most likely to maximize energy collection as required by this specific site. The fabrication, testing, and installation of the parabolic dish collector incorporating improvements identified during the development testing phase are described. DOE

N85-28461*# Research Triangle Inst., Durham, N. C.
COMPREHENSIVE SILICON SOLAR CELL COMPUTER MODELING Quarterly Progress Report, 5 Jul. - 4 Dec. 1984
M. F. Lamorte Mar. 1985 19 p refs
(Contract NAS7-100)
(NASA-CR-175959; DOE/JPL-956741-85/03; NAS 1.26:175959; DE85-009519; QPR-3) Avail: NTIS HC A02/MF A01 CSCL 10A

Phenomenological submodels of the optical absorption coefficient of solar cells and of the optimum grid contact design are presented and discussed. DOE

N85-28462# Purdue Univ., Lafayette, Ind. School of Electrical Engineering.
REPORT ON HIGH INTENSITY SOLAR CELLS
R. J. Schwartz, J. I. Gray, and M. S. Lundstrom Feb. 1985 137 p refs Prepared in cooperation with Sandia Labs.
(Contract DE-AC04-76DP-00789)
(DE85-008396; SAND-84-7002) Avail: NTIS HC A07/MF A01

Much effort was directed recently toward the development of high efficiency solar cells for terrestrial use. Significant progress was made for their use as an alternative to more conventional energy sources. Silicon solar cells in particular are rapidly approaching theoretical limitations in efficiency. To aid the development of more efficient solar cells, a mathematical model would be invaluable. Solar cell geometries could be compared and optimized before actual fabrication, eliminating problems caused by the uncertainties associated with device processing. Because analytic models require too many simplifying assumptions, numerical models must be used. Further, a two-dimensional model is needed because most solar cell geometries cannot be handled adequately in one dimension. A computer program, SCAP2D (Solar Cell Analysis Program in 2 Dimensions), capable of modeling a variety of solar cell structures under various operating conditions was developed. The potential of this program for use as a design and analysis tool was demonstrated by modeling the conventional, IBC, and vertical junction solar cells. DOE

N85-28463# Department of Energy, Washington, D. C. Wind Technology Div.
A 5-YEAR RESEARCH PLAN, 1985-1990. WIND ENERGY TECHNOLOGY: GENERATING POWER FROM THE WIND
Jan. 1985 35 p refs
(DE85-008427; DOE/CE-T11) Avail: NTIS HC A03/MF A01

The Department of Energy's current view of the research requirements for wind energy technology is presented. The goal of the Federal Wind Energy Program is to conduct research to establish a technology base and to support industry in confirming the viability of wind energy as an energy supply alternative. The federal program plan for achieving the good is outlined, and activities planned for fiscal years 1985 through 1989 are described. The four main features of the strategy are: (1) to identify how improvements in wind technology can be achieved; (2) to provide a framework for research and development activities; (3) to provide a management plant to ensure that progress is attained; and (4) to recognize the critical importance of an effective partnership between government and industry. DOE

N85-28464# Arizona State Univ., Tempe. School of Engineering.
TERRESTRIAL PHOTOVOLTAIC POWER SYSTEMS WITH SUNLIGHT CONCENTRATION Annual Progress Report, 1982 - 1983
C. E. Backus and R. W. Sanderson Feb. 1985 97 p refs
(Contract DE-AC04-76DP-00789)
(DE85-008398; SAND-84-7004) Avail: NTIS HC A05/MF A01

Several concentrator solar cells were tested with efficiencies approaching 20%. Trends in concentrator cell design continue toward smaller devices, reducing the total current generation per cell and reducing internal dissipation through series resistance. Concentrator cells of various thickness, but otherwise identical processing were tested, and as would be expected for silicon devices, one sun short circuit current increased with thickness. Peak efficiency also increased with thickness, but high irradiance performance was often better for thinner cells because of the decreased series resistance of the base region. Use of a properly calibrated and matched reference cell reduces measurement error caused by changes in the solar spectrum. Error due to spectral response mismatch between the test cell and reference cell can be quantified using a spectral mismatch parameter described. Reference cell calibration techniques currently in use include uncertainty due to the range of solar spectra permitted during calibration. A calibration technique is presented that eliminates this source of calibration error through the use of a tabular spectrum. DOE

N85-28465# ENTECH Corp., Dallas-Fort Worth Airport, Tex.
DEVELOPMENT OF A SECOND-GENERATION LINEAR FRESNEL PHOTOVOLTAIC AND THERMAL (PVT) CONCENTRATOR ARRAY, INCLUDING FABRICATION AND INSTALLATION OF A 200 SQUARE METER COLLECTOR FIELD
Mark J. ONeill Feb. 1985 108 p refs
(Contract DE-AC04-76DP-00789)
(DE85-008473; SAND-84-7020) Avail: NTIS HC A06/MF A01

Work performed in two areas is summarized: development of a second generation linear Fresnel lens photovoltaic concentrator array, and development and fabrication of a 22 kilowatt photovoltaic and thermal concentrator array. Under these programs a new second generation linear Fresnel lens PVT concentrator system, and a 200 square meter collector field of the new design were developed. The new system combines excellent performance and low mass production cost. DOE

N85-28466# Los Alamos Scientific Lab., N. Mex.
PERFORMANCE OF AN ACTIVE/PASSIVE HYBRID SOLAR SYSTEM UTILIZING VAPOR TRANSPORT
James C. Hedstrom 1984 34 p refs
(Contract W-7405-eng-36)
(DE85-008627; LA-UR-84-2003) Avail: NTIS HC A02/MF A01

Vapor-phase heat-transport systems are being tested in two of the passive test cells at Los Alamos. The systems consist of an active fin-and-tube collector and a condenser inside a water storage tank. The refrigerant, R-11, can be returned to the collector with a pump or with a self-pumping scheme. A computer model was developed to predict the behavior of the system, after which the computer was used to predict the annual performance of these systems in five cities. The report compares the measured and the predicted results as well as the system's sensitivity to several parameters. DOE

N85-28467# Battelle Inst., Frankfurt am Main (West Germany). Fachbereich Physikalische Technologien.
RESEARCH AND DEVELOPMENTAL STUDY ON MIS THIN FILM SOLAR CELLS OF AMORPHOUS HYDROGENATED SILICON, PART 2 Final Report, Jan. 1984
Hans Jaeger, Detlev Engeman, Marianne Ilgenstein, and Waltraud Roessler Bonn Bundesministerium fuer Forschung und Technologie Dec. 1984 63 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-84-290; ISSN-0340-7608) Avail: NTIS HC A04/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 13.50

The suitability of sputtered hydrogenated amorphous silicon (a-Si:H) layers for thin film solar cells is studied. The undoped intrinsic a-Si:H layers are optimized with respect to efficiency parameters, time stability, and resistance to sunlight. Schottky diodes and n-i-p layer structures were tested. Schottky diode efficiency can reach 6.8 mA/sq cm with a 2% improvement. Recombination effects in Schottky diodes with antireflection layers have to be overcome. The n-i-p layer structures have higher Voc values and lower JSC values than Schottky diodes. Further development of sputtered amorphous silicon solar cells is recommended. Author (ESA)

N85-28143# Joint Publications Research Service, Arlington, Va.
HIGH-ALTITUDE TESTING OF SELECTIVE OPTICAL COATINGS FOR SOLAR RADIATORS AND COLLECTORS Abstract Only
M. I. Umarova *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-85-004) 15 May 1985 p 6 Transl. into ENGLISH from Izv. Akad. Nauk Tadzhiksoy SSR Otd. Fiz.-Mat., Fiz. i Geol. Nauk (USSR), no. 1 (91), Jan. - Mar. 1984 p 77-80 (For primary document see N85-28142 17-31)
Avail: NTIS HC A06/MF A01

N85-28144# Joint Publications Research Service, Arlington, Va.
SELECTIVE COATINGS FOR SOLAR HEAT CONVERTERS Abstract Only
M. I. Umarova *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-85-004) 15 May 1985 p 6-7 Transl. into ENGLISH from Izv. Akad. Nauk Tadzhiksoy SSR Otd. Fiz.-Mat., Fiz. i Geol. Nauk (USSR), no. 2 (92), Apr. - Jun. 1984 p 61-71 (For primary document see N85-28142 17-31)
Avail: NTIS HC A06/MF A01

45 ENVIRONMENT POLLUTION

Includes air, noise, thermal and water pollution; environment monitoring; and contamination control.

N85-28468# Argonne National Lab., Ill.
OXYGEN ISOTOPIC STUDY OF THE OXIDATION OF SO2 BY H2O2 IN THE ATMOSPHERE
B. D. Holt and R. Kumar 1985 7 p refs Presented at 189th Natl. Meeting of the Am. Chem. Soc., Miami, Fla., 28 Apr. 1985
(Contract W-31-109-eng-38)
(DE85-004017; CONF-850417-5) Avail: NTIS HC A02/MF A01

This paper reports the readiness of a new isotopic method for studying the oxidation of SO2 by H2O2 in the atmosphere. So far, the analytical procedure has been applied to samples of rainwater from only two rain events at Argone, Il. DOE

N85-28469# Du Pont de Nemours (E. I.) and Co., Aiken, S.C. Savannah River Lab.
MICROCOMPUTER-CONTROLLED SYSTEM FOR MEASURING ATMOSPHERIC PARTICLE FLUXES
Robert Lorenz and Charles E. Murphy, Jr. 1985 7 p refs Presented at the 17th Conf. on Agr. and Forest Meteorol., Phoenix, Ariz., 20 May, 1985 Submitted for publication
(Contract DE-AC09-76SR-00001)
(DE85-007910; DP-MS-84-118; CONF-850581-2) Avail: NTIS HC A02/MF A01

A Hiac/Royco Model 4102 optical airborne particle counter equipped with the Model 1200 sensor was interfaced to an existing data acquisition system. Due to the location of the instruments and data transmission problems, special interfaces and software solutions were required to achieve data transmission and instrument control integrity. System design, instrument operation, and the software and hardware solutions required for operation are described. DOE

N85-28470# Delft Hydraulics Lab. (Netherlands).
WATER QUANTITY AND QUALITY RESEARCH FOR THE RHINE MEUSE ESTUARY
A. Roelfzema, M. Karelese, A. J. Struijk (Rijkswaterstaat), and M. Adriaanse (Rijkswaterstaat) Oct. 1984 18 p refs Presented at 19th Intern. Conf. on Coastal Eng., Houston, 3-7 Oct. 1984
(Publ-325) Avail: NTIS HC A02/MF A01

The effects of boundary conditions and changes in the tidal area on Rhine Meuse estuary water quantity and quality were studied. Tests carried out under cyclic and under time series conditions of several weeks show the importance of the interactions of harbors with the tidal boundary conditions. Wind effects generating elevations of the mean sea level introduce complex effects on the salinities. The mixing influence of harbors on the salinity distribution is significant. Closing all the harbors, implying decreased tidal filling and emptying volumes, results in an increase of vertical stratification and an increase of salinity intrusion. The same tendencies result from closing single harbors. Mathematical modeling of the estuary is discussed. Author (ESA)

N85-28471# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Oberpfaffenhofen (West Germany). Inst. fuer Physik der Atmosphaere.
INVESTIGATION OF AIR POLLUTION IMPACT IN EASTERN BAVARIA: MEASUREMENT RESULTS FROM AUGUST AND SEPTEMBER, 1984
Dieter Paffrath, Wolfgang Peters, and Josef Lidl Jan. 1985 137 p refs In GERMAN; ENGLISH summary
(DFVLR-FB-85-03; ISSN-0171-1342) Avail: NTIS HC A07/MF A01; DFVLR, Cologne DM 29

Measurement results of the spatial distribution of SO2, NO, O3 and particles, obtained using aircraft and vans, are presented. The distribution of impact of the various components in relation to meteorological conditions and the influence of local pollution sources is discussed. Author (ESA)

N85-28472# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Oberpfaffenhofen (West Germany). Inst. fuer Physik der Atmosphaere.

DFVLR MEASURING SYSTEM FOR THE DETERMINATION OF THE SPATIAL DISTRIBUTION OF ENVIRONMENTAL PARAMETERS OF THE ATMOSPHERE BY MEANS OF MOBILE INSTRUMENTED PLATFORMS

Dieter Paffrath Dec. 1984 70 p refs In GERMAN; ENGLISH summary Report will also be announced as translation (ESA-TT-924)
(DFVLR-FB-85-09; ISSN-0171-1342) Avail: NTIS HC A04/MF A01; DFVLR, Cologne DM 21

Mobile measuring platforms and measurement methods for the quantitative determination of the spatial distribution of air pollution concentration and of meteorological parameters are described. The measuring instruments are installed in a twin engined airplane for environmental research, in three motor gliders for acquisition of meteorological parameters, in a van for measuring aerosol and air pollution, and in a lidar system container for determination of the horizontal and vertical aerosol distribution. Author (ESA)

46 GEOPHYSICS

Includes aeronomy; upper and lower atmosphere studies; ionospheric and magnetospheric physics; and geomagnetism.

For space radiation see *93 Space Radiation.*

N85-28473 Bureau of Mineral Resources, Geology and Geophysics, Canberra (Australia). Div. of Geophysics.

AUSTRIALIAN SEISMOLOGICAL REPORT, 1980

David Denham, comp. and P. J. Gregson, comp. 1984 31 p
(Rept-252) Copyright. Avail: Issuing Activity

Information on all earthquakes of Richter magnitude 3 or greater resolved in the Australian region during 1980 as presented. Compiled by the Bureau of Mineral Resources, Geology & Geophysics (BMR) using data provided by various seismological agencies in Australia. Its purpose is to provide information on Australian earthquakes for the study of seismic risk and to answer inquiries from both scientists and the general public. The main sections are included: Australian earthquakes, which contains a summary of the 1980 seismicity and brief descriptions of the more important earthquakes; (2) Network operations', which gives details of the seismographs that operated in Australia during 1980; (3)Strong-motion seismograph data, which contains the results of the accelerograph network; and (4) Principal World Earthquakes 1980, which lists the largest and most damaging earthquakes. The terms magnitudes of earthquakes and intensities caused by earthquakes are defined. E.A.K.

N85-28474 Bureau of Mineral Resources, Geology and Geophysics, Canberra (Australia).

YEARBOOK OF THE BUREAU OF MINERAL RESOURCES, GEOLOGY AND PHYSICS: GEOSCIENTIFIC RESEARCH, RESOURCE ASSESSMENT, AND DATABASE DEVELOPMENT, 1 JUL. 1983 TO 30 JUN. 1984

30 Jun. 1984 181 p
(BMR-84) Copyright. Avail: Issuing Activity

The genesis and occurrence of petroleum and mineral resources were studied. A Geoscience Database Branch is established to coordinate bibliographic and numeric databases, while the Special Projects & Geoscience Services Branch continues to synthesize data on a national scale in map form. The latter Branch is also coordinating the production of several volumes synthesizing important aspects of Australian geology and geophysics, as a bicentenary project. During 1983-84 there was considerable progress in the development of these functions. The highest priority was given to research relating to fossil fuels and, in particular, to major geophysical programs. The most notable development was the initiation of a major new program of marine geoscience to study Australia's continental margins. A major program of studies of the deep structure of the continent by seismic reflection techniques is developed. This Australian continental reflection profiling program (ACORP) is coordinated with multidisciplinary studies of selected transects of the continent through collaboration with State geological surveys, universities, CSIRO, and industry. This, and other developments in the division of geophysics are summarized. Author

N85-28475*# SRI International Corp., Menlo Park, Calif. Dept. of Chemical Kinetics.

HOMOGENEOUS PROCESSES OF ATMOSPHERIC INTEREST Final Report, 1 May 1980 - 31 Oct. 1983

Michel J. Rossi, John R. Barker, and David M. Golden 15 Dec. 1983 185 p refs Sponsored by NASA Prepared for JPL
(NASA-CR-175770; JPL-9950-1096; NAS 1.26:175770) Avail: NTIS HC A09/MF A01 CSCL 04A

Upper atmospheric research programs in the department of chemical kinetics are reported. Topics discussed include: (1) third-order rate constants of atmospheric importance; (2) a computational study of the HO2 + HO2 and DO2 + DO2 reactions; (3) measurement and estimation of rate constants for modeling reactive systems; (4) kinetics and thermodynamics of ion-molecule association reactions; (5) entropy barriers in ion-molecule reactions; (6) reaction rate constant for OH + HOONO2 yields products over the temperature range 246 to 324 K; (7) very low-pressure photolysis of tert-bytyl nitrite at 248 nm; (8) summary of preliminary data for the photolysis of C1ONO2 and N2O5 at 285 nm; and (9) heterogeneous reaction of N2O5 and H2O. E.A.K.

N85-28476# Geological Survey, Washington, D.C.

PROCEEDINGS OF THE 1980 WORKSHOP OF THE INTERNATIONAL ASSOCIATION OF SEISMOLOGY AND PHYSICS OF THE EARTH'S INTERIOR ON THE SEISMIC MODELING OF LATERALLY VARYING STRUCTURES: CONTRIBUTIONS BASED ON DATA FROM THE 1978 SAUDI ARABIAN REFRACTION PROFILE

Walter D. Mooney, ed. and Claus Prodehl, ed. 1984 163 p refs Workshop held in Park City, Utah, 11-17 Aug. 1980
(GS-Circ-937; LC-84-600241) Avail: NTIS HC A08/MF A01

Seismic data was used to model laterally varying structures in Saudi Arabia. State of the art geophysical techniques were applied to seismic refraction data to develop models. Among the techniques employed were ray tracing to determine propagation velocity. For individual titles, see N85-28477 through N85-28491.

N85-28477# Ecole Polytechnique Federale, Zurich (Switzerland). Inst. of Geophysics.

PRELIMINARY INTERPRETATION OF SAUDI ARABIAN SEISMIC REFRACTION DATA

J. Ansorge, E. Banda, H. Benz (Utah Univ., Salt Lake City), S. Mueller, and R. B. Smith (Utah Univ., Salt Lake City) *In* Geological Survey Washington Proc. of the 1980 Workshop of the International Association of Seismology and Physics of the Earth's Interior on the Seismic Modeling of Laterally Varying Struct. 1984 p 7-13
(For primary document see N85-28476 17-46)
Avail: NTIS HC A08/MF A01

The very thin sedimentary or weathered layer near the surface has been ignored. Below this layer the velocity increases rapidly from 6.0 km/s to 6.2 km/s at a depth of about 2 km. This layer can be interpreted either as a weathered part of the basement or a separate layer overlying a basement with a velocity of 6.2 km/s. A more detailed interpretation of the available seismic and geologic data may answer this question. The critical distance of the underlying refractor with a velocity of 6.4 km/s suggests the existence of a low velocity layer with a thickness of about 5 km and an assumed velocity of 5.6 km/s. Both the low velocity layer

and the underlying 6.4 km/s layer are depressed by about 3 km from shotpoint 1 to shotpoint 2. The transition to the lower crust occurs at a depth of about 27 km with a sharp increase in velocity from 6.4 km/s to 6.8 km/s. G.L.C.

N85-28478# Geofyzkia Brno (Czechoslovakia).
TWO-DIMENSIONAL INVERSE KINEMATIC PROBLEM: APPLICATION TO THE SAUDI ARABIAN REFRACTION PROFILE
Petr Firbas *In* Geological Survey Washington Proc. of the 1980 Workshop of the International Association of Seismology and Physics of the Earth's Interior on the Seismic Modeling of Laterally Varying Struct. 1984 p 14-21 refs (For primary document see N85-28476 17-46)
Avail: NTIS HC A08/MF A01

An iterative method for solving the inverse kinematic problem for the two dimensional laterally inhomogeneous medium is proposed here based on the linearization approach and the ray theory. Model calculation results and the velocity model for a part of a refraction profile across Czechoslovakia are presented. The computer program solving the inverse kinematic problem based on the above mentioned algorithm is tentatively applied to the Saudi Arabian refraction profile data. Preliminary results are presented as a velocity contour map and verified by ray tracing. G.L.C.

N85-28479# Earth Physics Branch, Ottawa (Ontario). Div. of Seismology.
CRUSTAL STRUCTURE OF THE RED SEA-ARABIAN SHIELD TRANSITION Abstract Only
D. A. Forsyth, A. Green, and A. Mair *In* Geological Survey Washington Proc. of the 1980 Workshop of the International Association of Seismology and Physics of the Earth's Interior on the Seismic Modeling of Laterally Varying Struct. 1984 p 22-23 ref (For primary document see N85-28476 17-46)
Avail: NTIS HC A08/MF A01

Analysis of refraction records from (the southwestern three) shotpoints 4, 5, and 6 of the refraction profile across Saudi Arabia shows a complex structure in transition from oceanic to continental crust. Modeling was accomplished by comparing the data with: (1) traveltime curves for laterally homogeneous models, and (2) traveltime curves computed by ray tracing through models with lateral changes in velocity. G.L.C.

N85-28480# Geological Survey, Jiddah (Saudi Arabia).
A CRUSTAL SECTION FOR THE ARABIAN SHIELD AND ADJACENT RED SEA MARGIN DERIVED FROM FIRST-ARRIVAL DATA
M. E. Gettings *In* Geological Survey Washington Proc. of the 1980 Workshop of the International Association of Seismology and Physics of the Earth's Interior on the Seismic Modeling of Laterally Varying Struct. 1984 p 24-27 refs (For primary document see N85-28476 17-46)
Avail: NTIS HC A08/MF A01

Production of a regional crustal model for the Arabian Shield and bordering provinces is a major objective of the Saudi Arabian Mission of the U.S. Geological Survey. Regional geologic, seismic refraction, gravity, and aeromagnetic studies form the principal data base for construction of the crustal model, and in order to provide a starting model for interpretation of regional gravity and heat flow patterns, a preliminary analysis of the results of the Saudi Arabian long range seismic refraction profile was carried out. The objective was to produce a generalized crustal section consistent with the refraction data. At the time of this work the only record sections available were the uncorrected field data sections. Consequently, only an elementary analysis based on first arrival times was attempted. G.L.C.

N85-28481# Tel-Aviv Univ. (Israel). Dept. of Geophysics and Planetary Sciences.
A SEISMIC REFRACTION PROFILE ACROSS THE ARABIAN SHIELD Abstract Only
A. Ginzburg *In* Geological Survey Washington Proc. of the 1980 Workshop of the International Association of Seismology and Physics of the Earth's Interior on the Seismic Modeling of Laterally Varying Struct. 1984 p 28-29 refs (For primary document see N85-28476 17-46)
Avail: NTIS HC A08/MF A01

In this brief attempt at interpreting the Saudi Arabian data set emphasis was put on the continental part of the profile--shotpoints 1 to 5. The approach adopted was conventional. A first approximation of the crustal model comprising depths and velocities was derived from apparent velocities of the correlated hases and their intercept times. Branches used were Pg, Pn, P* where correlatable, and PmP in one instance. Of particular interest were the reversed segments between shotpoints 1-2, 3-4, and 4-5, which were used to establish the true velocities and depths at the shotpoints. Although these segments are relatively short, good Pn arrivals were recorded at distances of up to 250 km. The intercept-apparent velocity computations were checked by the use of tau(p) inversion scheme for inclined layers. The calculated true velocities were 6.1-6.2 km/s for the Pg branch, 6.6 km/s for P*, and 8/1 for the Pn branch. These velocities and computed depths were used as an initial model in an iterative ray-tracing program which was used for the computation of the final model. G.L.C.

N85-28482# Leicester Univ. (England). Dept. of Geology.
A PRELIMINARY EXAMINATION OF THE 1978 REFRACTION PROFILES IN SAUDI ARABIA
P. K. H. Maguire *In* Geological Survey Washington Proc. of the 1980 Workshop of the International Association of Seismology and Physics of the Earth's Interior on the Seismic Modeling of Laterally Varying Struct. 1984 p 37-40 (For primary document see N85-28476 17-46)
Avail: NTIS HC A08/MF A01

A conventional first interpretation of the data from the 1978 refraction profiles in Saudia Arabia has been carried out. This involved a constant velocity, horizontal layer model derived from first-arrival data, supplemented by selected points from second-arrival prograde and retrograde branches. Smoothed local gradients of retrograde branches were also determined to allow definition of the type of transition across particular boundaries for later analysis. G.L.C.

N85-28483# Scripps Institution of Oceanography, La Jolla, Calif. Geological Research Div.
THE RIFTED MARGIN OF SAUDI ARABIA Abstract Only
James S. McClain and John A. Orcutt *In* Geological Survey Washington Proc. of the 1980 Workshop of the International Association of Seismology and Physics of the Earth's Interior on the Seismic Modeling of Laterally Varying Struct. 1984 p 41-42 ref (For primary document see N85-28476 17-46)
Avail: NTIS HC A08/MF A01

The structure of rifted continental margins has always been of great scientific interest, and now, with dwindling economic oil deposits, these complex geological features assume practical importance as well. The ocean-continent transition is, by definition, laterally heterogeneous and likely to be extremely complicated. The southernmost shotpoints (4, 5, and 6) in the U.S. Geological Survey seismic refraction profile in the Kingdom of Saudi Arabia lie within a transition region and thus provide a testing ground for methods that treat wave propagation in laterally heterogeneous media. This portion of the profile runs from the Farasan Islands in the Red Sea across the coast line and the Hijaz-Asir escarpment into the Hijaz-Asir tectonic province. Because the southernmost shotpoint is within the margin of the Saudi sub-continent, the full transition region is not sampled. Furthermore, such an experiment is precluded by the narrowness of the purely oceanic portion of the Red Sea. G.L.C.

N85-28484# Kiel Univ. (West Germany). Inst. fuer Geophysik.
SAUDI ARABIAN REFRACTION PROFILE: CRUSTAL STRUCTURE OF THE RED SEA-ARABIAN SHIELD TRANSITION
B. Milkereit and E. R. Flueh *In* Geological Survey Washington Proc. of the 1980 Workshop of the International Association of Seismology and Physics of the Earth's Interior on the Seismic Modeling of Laterally Varying Struct. 1984 p 43-46 refs (For

primary document see N85-28476 17-46)
Avail: NTIS HC A08/MF A01

Analysis of the two southwesternmost shotpoints of the Saudi Arabian refraction line shows a great degree of lateral heterogeneity. Ocean-continent transition zones were studied all over the world, always showing rather high or low apparent velocities of many traveltime branches and either large or small intercept times. Therefore, a two-dimensional ray-tracing program seems to be an appropriate method for the interpretation of the data set. The breaking up of the Red Sea Rift about 25 million years ago induced strong tectonic forces against the margin of the Saudi Arabian Shield. The model structure is in agreement with the concept about the development of continental margins. Plume material has a tendency to intrude at lower continental crust levels at the beginning of the rifting. The nappe structure of the model can be attributed to such an intrusion. This intrusion is overlain by continental material and shelf sediments, here consisting of mainly salt. B.G.

N85-28485# Institut fuer Allgemeine und Angewandte Geophysik, Munich (West Germany).
SAUDI ARABIAN REFRACTION PROFILE: A PRELIMINARY INTERPRETATION FOR THE RED SEA-ARABIAN SHIELD TRANSITION Abstract Only
H. Miller *In* Geological Survey Washington Proc. of the 1980 Workshop of the International Association of Seismology and Physics of the Earth's Interior on the Seismic Modeling of Laterally Varying Struct. 1984 p 47-48 (For primary document see N85-28476 17-46)
Avail: NTIS HC A08/MF A01

An attempt was made to resolve the crustal structure between shotpoints 5 and 6 of the Saudi Arabian refraction seismic line. As is evident from the record sections, this part of the line has the greatest degree of lateral heterogeneity. The results obtained by ray tracing are of a very preliminary nature and only a general idea of the structure will be outlined. In general, a very rapid increase in crustal thickness from south to north exists. With an average velocity of 4.2 km/s, the top part of the crust from shotpoint 6 to approximately 60 km to the north may consist of sediments or ocean layer 2 material or both. The crust is thin, the Moho being at a depth of 12 km. The Moho is modeled as a sharp discontinuity, below which a velocity inversion must exist in order to explain the traveltimes of the very prominent arrivals with apparent velocities of 8.4 km/s at distance beyond 200 km. South of shotpoint 5 the Moho is at a depth of some 27 km with a mean upper crustal velocity of 6.2 km/s and a mean lower crustal velocity of 6.8 km/s. Author

N85-28486# Geological Survey, Menlo Park, Calif.
A TRAVELTIME INTERPRETATION OF THE 1978 SEISMIC REFRACTION PROFILE IN THE KINGDOM OF SAUDI ARABIA
Walter D. Mooney *In* Geological Survey Washington Proc. of the 1980 Workshop of the International Association of Seismology and Physics of the Earth's Interior on the Seismic Modeling of Laterally Varying Struct. 1984 p 49-79 refs (For primary document see N85-28476 17-46)
Avail: NTIS HC A08/MF A01

Traveltime analysis of the USGS/DGMR-conducted seismic refraction profile in Saudi Arabia is described. The analyzed data consist of reversing and overlapping profiles obtained from six shotpoints extending from the southern Red Sea nearly to the city of Riyadh on the Arabian Shield. Data analysis consisted of the following steps. Primary and secondary arrivals were determined from record sections reduced to 6.0 or 8.0 km/s. The phases were identified as either refracted or reflected waves based on their amplitudes and traveltime behavior. The one-dimensional models (velocity as a function of depth only) to the southwest and northeast of each shotpoint were combined to make preliminary two-dimensional models. Qualitative judgments were made concerning the relative sharpness of the seismic discontinuities on the basis of the apparent amplitude relations of the various phases, and these judgments were used to vary the two-dimensional model. B.G.

N85-28487# Academy of Sciences (USSR), Moscow. Inst. of the Physics of the Earth.
EXPLANATION OF RUSSIAN MODELS: SAUDI ARABIAN SEISMIC REFRACTION PROFILE Abstract Only
N. I. Pavlenkova and I. P. Kosminskaya *In* Geological Survey Washington Proc. of the 1980 Workshop of the International Association of Seismology and Physics of the Earth's Interior on the Seismic Modeling of Laterally Varying Struct. 1984 p 80-81 (For primary document see N85-28476 17-46)
Avail: NTIS HC A08/MF A01

Three models were presented: a one-dimensional model for all shotpoints which used a formula for depth calculation from refractions and reflections which takes into account a multi-layered structure of the medium; a time-field method which employs for depth calculation the times at equal distances for all shotpoints; and a two-dimension problem using the intercept time method for the initial model construction and then the ray tracing method for improvement. Calculations show that the simple model with uplifted mantle-velocity rocks in the Red Sea area cannot explain the observed pattern. A zone of decreasing velocity is needed to match the time delay and amplitude changes. An agreement is possible using the model with a low-velocity zone beneath the uplift, that is, the model with a separate mantle-velocity intrusion beneath the Red Sea. Considering the uncertainty of other seismic interpretation methods, models that were not tested by the ray-trace method in two-dimensional versions cannot be considered as possible models. B.G.

N85-28488# Karlsruhe Univ. (West Germany). Geophysikalisches Inst.
INTERPRETATION OF THE DATA OF USGS SEISMIC REFRACTION PROFILE ACROSS THE ARABIAN SHIELD IN WESTERN SAUDI ARABIA
Claus Prodehl *In* Geological Survey Washington Proc. of the 1980 Workshop of the International Association of Seismology and Physics of the Earth's Interior on the Seismic Modeling of Laterally Varying Struct. 1984 p 82-116 refs (For primary document see N85-28476 17-46)
Avail: NTIS HC A08/MF A01

Based on the record sections distributed a preliminary travel-time interpretation assuming horizontally flat layering is presented in the form of velocity-depth functions and a corresponding cross section of the lithosphere to a depth of 60 to 80 km across the Arabian Shield in western Saudi Arabia. The crust thickens abruptly from 15 km beneath the Red Sea Rift to about 40 km beneath the Arabian Shield. The upper crust of the western Arabian Shield yields relatively high-velocity material at about 10 km depth underlain by velocity inversions, while the upper crust of the eastern Shield is relatively uniform. The lower crust with a velocity of about 7 km/s is underlain by a transitional crust-mantle boundary. For the lower lithosphere beneath 40 km depth a laterally discontinuous lamellar structure may exist where high-velocity zones are mixed with zones of lower velocities. Beneath the crust-mantle boundary of the Red Sea Rift strong velocity inversions with velocities as low as 6.0 km/s may be encountered between 25 and 44 km depth. This model was prepared before the CCSS workshop. The model was tested using ray-tracing and amplitude studies and agreed well with observed traveltimes, except between shotpoints 5 and 6. Author

N85-28489# State Seismological Bureau of China, Beijing. Inst. of Geophysics.
A PRELIMINARY ANALYSIS OF THE SAUDI ARABIAN DEEP SEISMIC SOUNDING DATA
Zeng Rong-sheng, Hu Hong-siang, and Zhang Shao-quan *In* Geological Survey Washington Proc. of the 1980 Workshop of the International Association of Seismology and Physics of the Earth's Interior on the Seismic Modeling of Laterally Varying Struct. 1984 p 117-124 (For primary document see N85-28476 17-46)
Avail: NTIS HC A08/MF A01

The traveltime data curve from shot points 1 through 4 is analyzed. P sub 1 is the refracted wave from the crystalline basement, showing an increase in velocity from 6.0 to 6.3 km/s.

P sub 1 seems to stop at a distance of about 140 km from shotpoint 3. At a distance less than 50 km from the shotpoints, the transverse S wave (corresponding to P sub 1) and the Rayleigh waves of the superficial layer are very prominent. Since there are no available data on the sedimentary layer, the velocity was derived from the dispersion of the Rayleigh waves. Successive modifications of the model were derived until an ideal fit of the calculated values with the observed values of the traveltimes were obtained. B.G.

N85-28490# Geological Survey, Jiddah (Saudi Arabia).
ONE-DIMENSIONAL VELOCITY-DEPTH FUNCTIONS DETERMINED FOR THE ARABIAN SHIELD AND THE SOUTHWESTERN RED SEA: A COMPARISON OF MODELS
W. D. Mooney and M. E. Gettings (Geological Survey, Jiddah, Saudi Arabia) *In* Geological Survey Washington Proc. of the 1980 Workshop of the International Association of Seismology and Physics of the Earth's Interior on the Seismic Modeling of Laterally Varying Struct. 1984 p 125-139 refs (For primary document see N85-28476 17-46)
Avail: NTIS HC A08/MF A01

The use of the Saudi Arabian seismic refraction data resulted in as many as 14 interpretations of the velocity-depth structure along the profile. These interpretations were compared and discussed, in order to identify the common aspects as well as those aspects with a significant diversity of interpretation. Future analyses of these data will help resolve the structure in those portions of the crust and upper mantle with the greatest diversity of interpretation. B.G.

N85-28491# Geological Survey, Washington, D.C.
A COMPARISON OF CRUSTAL SECTIONS: ARABIAN SHIELD TO THE RED SEA
Walter D. Mooney and Claus Prodehl (Karlsruhe Univ.) *In* Geological Survey Washington Proc. of the 1980 Workshop of the International Association of Seismology and Physics of the Earth's Interior on the Seismic Modeling of Laterally Varying Struct. 1984 p 140-153 refs (For primary document see N85-28476 17-46)
Avail: NTIS HC A08/MF A01

The use of the Saudi Arabian seismic refraction data made possible the compilation of ten complete crustal sections from the Red Sea across the Arabian Shield to the Arabian Platform. These sections are presented on the same vertical and horizontal scale to facilitate a discussion of lateral variations in structure which were not evident before. The sections vary in detail from presenting only the general outline of the structure to more complete presentations of the crust and upper mantle. No comparisons were made of layer thicknesses and velocities, nor were the different methods of interpretation. B.G.

N85-28492# Aerospace Corp., El Segundo, Calif. Space Sciences Lab.
IMS (INTERNATIONAL MAGNETOSPHERIC STUDY) CONTRIBUTIONS TO THE UNDERSTANDING OF AURORAL PRECIPITATION, TRANSPORT, AND PARTICLE SOURCES
J. F. Fennell 1 Mar. 1985 44 p
(Contract F04701-83-C-0084)
(AD-A152320; TR-0084A(5940-05)-2; SD-TR-85-06) Avail: NTIS HC A03/MF A01 CSCL 04/1

The progress in our understanding of plasma processes throughout the magnetosphere has increased dramatically during the International Magnetospheric Study (IMS) period. In this report the auroral ionosphere as a source of particles for the magnetosphere and the auroral particle acceleration and precipitation are emphasized. Some of the processes involved in the transport of particles from the ionosphere out into the magnetosphere are treated as well as the precipitation of magnetospheric into the auroral and subauroral ionosphere. Some of the effects auroral ionospheric ions have on the magnetospheric plasma composition are described. A brief overview of pre-IMS results is also given to set the stage for a description of IMS contributions in these areas. Keywords include: Auroral particles, Polar regions, Auroral plasmas, and IMS. GRA

N85-28493# Naval Postgraduate School, Monterey, Calif.
AN ASSESSMENT OF ATMOSPHERIC REFRACTIVITY IN THE NORTHERN MARGINAL ICE ZONE M.S. Thesis
C. T. Sutherlin Sep. 1984 119 p
(AD-A152346) Avail: NTIS HC A06/MF A01 CSCL 04/1

This thesis presents an analysis of atmospheric refractivity conditions in the Arctic Marginal Ice Zone. The fundamental principles of atmospheric effects on electromagnetic wave propagation are presented along with methods to assess these effects. Using these principles, a determination of the occurrence of atmospheric ducts is made from meteorological data gathered during the Arctic Marginal Ice Zone Exercise, 1983, MIZEX-83. The optimum coupling height, thickness and intensity of each duct are calculated and statistically compared. Duct occurrence is related to area meteorological conditions. Based on area refractivity, the potential for enhanced electronic warfare operations is evaluated. GRA

N85-28494# Naval Weapons Center, China Lake, Calif.
QUALITY ASSURANCE FOR RESOLVE (RESEARCH ON OPERATIONS-LIMITING VISUAL EXTINCTION). A VISIBILITY STUDY IN THE CALIFORNIA DESERT
A. Pitchford, M. Pitchford, D. Chaloud, and P. Feeney Jan. 1985 22 p
(AD-A152383; AD-E900434; NWC-TP-6591) Avail: NTIS HC A02/MF A01 CSCL 04/1

The objective of RESOLVE is: to understand the effects of present air pollution sources on visibility in the testing region airspace (R2508 airspace), and to identify the major pollutant sources and transport routes that contribute to visibility degradation. Another aim is to determine baseline and spatial and temporal variability and trends for atmospheric visibility, aerosol characteristics, and related meteorological parameters in the study area, with special emphasis on selected locations at the military facilities. This report focuses on the role and effect of quality assurance activities in the routine monitoring portion of the project. Data recovery statistics for the initial 10 months of operation are presented, along with precision and stability estimates for nephelometers and teleradiometers. GRA

N85-28495# California Univ., Berkeley.
ADVANCES IN TECHNOLOGY DEVELOPMENT FOR EXOATMOSPHERIC RESEARCH Final Technical Report
24 Jan. 1985 5 p
(Contract DASG60-82-C-0007)
(AD-A152581) Avail: NTIS HC A02/MF A01 CSCL 04/1

Basically, the Final Technical Report consists of a listing of the many Technical Reports submitted during this research effort. GRA

N85-28496# Iowa Univ., Iowa City. Dept. of Physics and Astronomy.
THE BOUNDARY LAYERS AS THE PRIMARY TRANSPORT REGIONS OF THE EARTH'S MAGNETOTAIL Scientific Report, 1977 - 1979
T. E. Eastman, L. A. Frank, and C. Y. Huang Feb. 1985 61 p
(Contract N00014-76-C-0016)
(AD-A152714; U-OF-IOWA-83-7) Avail: NTIS HC A04/MF A01 CSCL 04/1

A comprehensive survey of ISEE and IMP LEPEDEA plasma measurements in the earth's magnetotail reveals that the magnetotail reveals that the magnetospheric boundary layer and the plasma sheet boundary layer are the primary transport regions there. These plasma measurements also reveal various components of the plasma sheet, including the central plasma sheet and plasma sheet boundary layer. A significant new result reported here is that of cold- and hot-plasma components that are spatially co-present within the central plasma sheet. Such plasma components cannot be explained merely by temporal variations in spectra involving the entire plasma sheet. Contributions to a low temperature

component of the plasma sheet enter directly from the boundary layer located along the magnetotail flanks. Field-aligned flows predominate within the plasma sheet boundary layer which is almost always present and is located near the high- and low-latitude border of the plasma sheet. The plasma sheet boundary layer comprises highly anisotropic ion distributions, including counter-streaming ion beams, that evolve into the hot, isotropic component of the plasma sheet. Tailward acceleration regions generate these ion beams with plasma input from the magnetospheric boundary layer. Antisunward-flowing ion beams, at $E/q < 1$ kV and of ionospheric composition, are frequently observed in the plasma sheet boundary layer and in tail lobes. These ion beams are likely accelerated at low altitude over the polar cap and especially along auroral field lines. GRA

N85-28497# Science Applications, Inc., McLean, Va.
GEOPHYSICAL PLASMAS AND ATMOSPHERIC MODELING Final Report
E. Hyman, P. Chaturvedi, J. Chen, J. Drake, and G. Ganguli Mar. 1985 392 p
(Contract N00014-84-C-2032)
(AD-A152805; SAIC-85-/1621) Avail: NTIS HC A17/MF A01 CSCL 04/1

Contents: Collisionless Tearing Instability in a Non-Mexwellian Neutral Sheet: An Integro-Differential Formulation; Nonlocal Effects on the Convective Properties of the Electrostatic Current-Driven Ion-Cyclotron Instability; Two Dimensional Nonlocal Formalism for Electrostatic Waves in the Magnetosphere; The Role of Nonlocalities in Magnetosphere-Ionosphere Coupling Processes; O(+) Acceleration Due to Resistive Momentum Transfer in the Auroral Field Line Plasma; Behavior of Ionized Plasma in the High Latitude Topside Ionosphere; Stabilization of the Collisional Current-Driven Ion Cyclotron Instability; Production and Control of Ion Cyclotron Instabilities in the High Latitude Ionosphere by High Power Radio Waves; Effects of Finite Current Channel Width on the Current Convective Instability; Ionospheric Turbulence: Interchange Instabilitiies and Chaotic Fluid Behavior; Estimating Spectral Indices from Transforms of Discrete Representations of Density Functions; Projections of Plasma Structures and Their Spectra; The Role of Finite Parallel Length on the Stability of Barium Clouds; Finite Temperature Stabilization of the Gradient Drift Instability in Barium Clouds; Finite Temperature Effects on the Evolution of Ionospheric Barium Clouds in the Presence of a Conducting Background Ionosphere I. A High Altitude Incompressible Background Ionosphere; and A Three Dimensional Model of the Summer Monsoon. GRA

N85-28498# Lancaster Univ., Bailrigg (England). Dept. of Environmental Sciences.
EISCAT ELECTRON DENSITY STUDIES Final Report, 15 Oct. 1983 - 29 Jan. 1985
J. K. Hargreaves and C. J. Burns 29 Jan. 1985 42 p
(AF Proj. 2310)
(AD-A152820; AFGL-TR-85-0052) Avail: NTIS HC A03/MF A01 CSCL 04/1

Studies of the auroral ionosphere by incoherent-scatter radar have continued, with further observations of the fine structure of the F-region and with detailed analyses of data so obtained during the last three years. It has been demonstrated that irregular structures with scale sizes measured in kilometers can on occassion be detected by the EISCAT UHF radar to altitudes of at least 750 km, and first results on the magnitude, time structure, and velocity of these structures are presented. GRA

N85-28499# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
FORECAST VERIFICATION OF THE 10.7 CENTIMETER SOLAR FLUX AND THE Ap DAILY GEOMAGNETIC ACTIVITY INDICES M.S. Thesis
P. M. Nostrand Dec. 1984 117 p
(AD-A152959; AFIT/GSO/PH-OS/84D-2) Avail: NTIS HC A06/MF A01 CSCL 04/1

Air Force Global Weather Central space environmental forecasts of the 10.7 centimeter solar radioflux index and the Ap daily average geomagnetic activity index were compared with persistence forecasts to check for accuracy and skill. One, two and three day forecasts were compared. The AFGWC forecasts were found to be more accurate and skillful than the persistence forecasts. The data base covered the period from 4 January 1971 through 29 April 1984. Statistics were calculated for the total data set and each individual year. Root mean square error and percentage of significant errors were used as measures of accuracy. A paired sign test was used to compare for skill. The test was run on significant errors and absolute errors. A significant error is when the difference between the forecast value and the verifying observed value (i.e., the observation one, two or three days hence) is greater than 10. This thesis set out to do two things: to check the accuracy of AFGWC forecasts and persistence as a forecast and to conduct a test which would determine if the forecasters exhibited skill when compared to persistence as an unskilled forecasts. GRA

N85-28500# Boston Coll., Chestnut Hill, Mass. Dept. of Physics.
ELECTRON AND ION DISTRIBUTIONS AT HIGH LATITUDES AS MEASURED BY THE AIR FORCE POLAR ORBITING SATELLITES Final Report, 1 Apr. 1981 - 30 Sep. 1983
M. S. Gussenhoven Hanscom AFB, Mass. AFGL 26 Feb. 1985 242 p
(AF Proj. 2311)
(AD-A153242; AFGL-TR-85-0021) Avail: NTIS HC A11/MF A01 CSCL 04/1

The Final Report for Contract F19628-81-K-0032 presents the results of major studies using Air Force Satellite particle data. These are divided into three main categories: auroral boundary studies; statistical studies of precipitating electrons; and particle dynamics along field lines. In the first, the variation of the equatorial electron boundary is determined as a function of solar wind velocity, IMF-Bz component, Kp, AE and Dst. The systematic variation of the boundary with Kp is used to create an auroral boundary index. In addition, comparison of the variation of the variation in the equatorward ion boundary with the electron boundary is given. In the second section the large-scale properties of precipitating electrons measured at low altitudes, empirical contributions to the baseline magnetosphere, and statistical maps of electron precipitation are presented. The occurrence and properties of extremely high latitude (polar cap) auroras are studied using both particle data and DMSP images; a morphology of the polar rain is also developed. Finally, in the third section, the problem of particle dynamics along magnetospheric field lines is addressed by studies comparing electrons at geosynchronous and low altitudes both statistically and near-simultaneously in case studies; and by a study of induced electromagnetic waves from electron beams. GRA

N85-28501# Arizona Univ., Tucson. Dept. of Geosciences.
STRUCTURAL ANALYSIS OF TERRANE ACCRETIONS IN THE EASTERN BROOKS RANGE AND ADJACENT AREAS IN CENTRAL ALASKA AND CANADA Technical Progress Report
Peter J. Coney and Tekla A. Harms 14 Mar. 1985 2 p
(Contract DE-AC21-84MC-21129)
(DE85-008279; DOE/MC-21129/T6; TPR-6) Avail: NTIS HC A02/MF A01

Work on radiolarian separation and identification of samples from the Sylvester Allochthon is nearing completion. A preliminary chronostratigraphic chart showing the age range and lithologic type of all dated units was drawn. The comparative petrography of lithologies from the Sylvester Allochthon and the Angayucham and Mosquito Terranes, and from deformed clastic rocks of the Venetie Terrane is being studied. Several preliminary structure sections were drawn across the Sylvester Terrane. DOE

N85-28502# Cologne Univ. (West Germany). Inst. fuer Geophysik und Meteorologie.
KINETIC ENERGY AND VORTICITY OF LEE CYCLONES [KINETISCHE ENERGIE UND VORTICITY VON LEE-ZYKLONEN]
Gerd Frenzen 1984 116 p refs In GERMAN; ENGLISH summary

Sponsored by Deutsche Forschungsgeinschaft
(MITT-40; ISSN-0069-5882) Avail: NTIS HC A06/MF A01

Kinetic energy, vorticity, and the terms of the corresponding budget equations were investigated for five cases of Alpine lee cyclogenesis during the ALPEX-SOP experiment. A diagnostic comparison of several lee-cyclone developments was performed by spatial distributions and area-averages over a quasi-Lagrange reference frame of the diagnostic quantities under consideration. Basic data are fine-mesh numerical analyses with a high resolution in time and space. Despite the different synoptic developments, terms of the budget equations under consideration show a similar behavior. Orographic influences are clearly recognizable.
Author (ESA)

N85-28503# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Oberpfaffenhofen (West Germany). Abt. Wolkenphysik.

ON LONG'S SOLUTION TO HYDROSTATIC FLOW OVER MOUNTAINS

Thomas Jank Jan. 1984 63 p refs In GERMAN; ENGLISH summary
(DFVLR-Mitt-84-02) Avail: NTIS HC A04/MF A01; DFVLR, Cologne DM 20.50

A numerical procedure for the solution of Long's equation with a nonlinear upper boundary condition is presented for various mountain profiles. The procedure reduces the solution of Long's equation to the solution of a one-dimensional integral equation. A method for the solution of this integral equation and a technique for the determination of the streamlines and the respective flow velocities are described. Author (ESA)

N85-28504# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Oberpfaffenhofen (West Germany). Abteilung Umweltmeteorologie.

ABSOLUTE CALIBRATIONS OF SO2 AND NO ANALYZERS BY PHOTOGRAPHIC METHODS

Monika Paffrath Nov. 1984 56 p refs In GERMAN; ENGLISH summary
(DFVLR-Mitt-85-02; ISSN-0176-7739) Avail: NTIS HC A04/MF A01; DFVLR, Cologne DM 18.50

Two photometric methods using organic substances and solutions for calibrating flame photometer detectors (for measuring SO2) and chemiluminescent analyzers (for measuring NO) used in atmospheric chemistry are described. The accuracy of these methods (6%) depends on the applied measuring instruments, on the purity of the chemicals, and on the procedure applied in solution production. Author (ESA)

47 METEOROLOGY AND CLIMATOLOGY

Includes weather forecasting and modification.

N85-28505 Department of the Air Force, Washington, D.C.

SNOW SCALE/RATE METER Patent

V. G. Plank, A. J. Matthews, R. O. Berthel, and D. L. LaGross, inventors (to Air Force) Issued 19 Feb. 1985 7 p Supersedes AD-D010351
(AD-D011648; US-Patent-4,499,761; US-Patent-Appl-SN-442494; US-Patent-Class-73-170R) Avail: US Patent and Trademark Office CSCL 04/2

A snow scale/rate meter having a highly accurrate weight sensing device enclosed in a thermally controlled environment. A clear plastic collection bucket is operably connected by means of an elongated shaft to the weight sensing device. In addition, a plurality of wind protection device surround the collection bucket as well as the limit collected snowfall to snowfall having trajectories of 45 deg. or less from the vertical. Snowfall weight and rate data can be accurately provided by this meter over extremely short intervals of times during in-the-field operation. GRA

N85-28506*# Wisconsin Univ., Madison. Space Science and Engineering Center.

CENTRALIZED STORM INFORMATION SYSTEM (CSIS) Final Report

Carl C. Norton Apr. 1985 152 p refs
(Grant NAGw-3476)
(NASA-CR-175898; NAS 1.26:175898) Avail: NTIS HC A08/MF A01 CSCL 04B

A final progress report is presented on the Centralized Storm Information System (CSIS). The primary purpose of the CSIS is to demonstrate and evaluate real time interactive computerized data collection, interpretation and display techniques as applied to severe weather forecasting. CSIS objectives pertaining to improved severe storm forecasting and warning systems are outlined. The positive impact that CSIS has had on the National Severe Storms Forecast Center (NSSFC) is discussed. The benefits of interactive processing systems on the forecasting ability of the NSSFC are described. For individual titles, see N85-28507 through N85-28510.

N85-28507*# Wisconsin Univ., Madison.

A REPORT FROM THE SPACE SCIENCE AND ENGINEERING CENTER, THE UNIVERSITY OF WISCONSIN-MADISON, MADISON, WISCONSIN Final Report

In its Centralized Storm Information System (CSIS) Apr. 1985 9 p refs (For primary document see N85-28506 17-47)
Avail: NTIS HC A08/MF A01 CSCL 04B

Operational forecasters have habitually been plagued with the problems associated with acquisition, display, and dissemination of data used in preparing forecasts. The centralized storm information system (CSIS) experiment provided an operational forecaster with an interactive computer system which could perform these preliminary tasks more quickly and accurately than any human could. CSIS objectives pertaining to improved severe storms forecasting and warning procedures are addressed. B.W.

N85-28508*# Wisconsin Univ., Madison.

TEST AND EVALUATION PLAN FOR THE CENTRALIZED STORM INFORMATION SYSTEM Final Report

In its Centralized Storm Information System (CSIS) Apr. 1985 30 p (For primary document see N85-28506 17-47)
Avail: NTIS HC A08/MF A01 CSCL 04B

The installation of the Centralized Storm Information System (CSIS) at the NOAA operational complex in Kansas City, Missouri is described. This complex includes the National Severe Storms Forecast center and a Satellite Field Service Station which is denoted in this research plan as NSSFC. CSIS computers will act in concert to merge analyze the many data sets needed to forecast severe convective storms. Specific aspects of CSIS are evaluated against the CSIS objectives. The functions to be evaluated characterize the attributes of a generalized interactive computer system. A major development in the CSIS program will allow communication between CSIS and the NSSFC Eclipse computer.
B.W.

N85-28509*# National Severe Storms Forecast Center, Kansas City, Mo.

CSIS TEST AND EVALUATION Final Report, Oct. 1983

A. L. Siebers, J. T. Schaefer, R. W. Anthony, W. E. Carle, W. D. Hirt, D. W. McCann, and K. C. McCarthy *In* Wisconsin Univ. Centralized Storm Information System (CSIS) Apr. 1985 43 p (For primary document see N85-28506 17-47)
Avail: NTIS HC A08/MF A01 CSCL 04B

This report covers the period from February 1982 when the Centralized Storm Information System CSIS was installed at NSSFC through June 1983. CSIS has had a dramatic and positive impact on the operations of the NSSFC. The value of CSIS in improving the level of severe storms forecasting is evaluated. The following CSIS components are examined: (1) hardware; (2) data acquisition; (3) data storage and retrieval; (4) forecaster-machine interface; (5) user training and requirement; (6) system relibility; and (7) software documentation. B.W.

N85-28510*# National Severe Storms Forecast Center, Kansas City, Mo.

FUNCTIONAL AND PERFORMANCE REQUIREMENTS OF THE NEXT NOAA-KASAS CITY COMPUTER SYSTEM Final Report, Oct. 1984

Frederick R. Mosher *In* Wisconsin Univ. Centralized Storm Information System (CSIS) Apr. 1985 69 p (For primary document see N85-28506 17-47)

Avail: NTIS HC A08/MF A01 CSCL 04B

The development of the Advanced Weather Interactive Processing System for the 1990's (AWIPS-90) will result in more timely and accurate forecasts with improved cost effectiveness. As part of the AWIPS-90 initiative, the National Meteorological Center (NMC), the National Severe Storms Forecast Center (NSSFC), and the National Hurricane Center (NHC) are to receive upgrades of interactive processing systems. This National Center Upgrade program will support the specialized inter-center communications, data acquisition, and processing needs of these centers. The missions, current capabilities and general functional requirements for the upgrade to the NSSFC are addressed. System capabilities are discussed along with the requirements for the upgraded system. B.W.

N85-28511*# Simpson Weather Associates, Charlottesville, Va.

CONVECTIVE STORM DOWNDRAFT OUTFLOWS DETECTED BY NASA/MSFC'S AIRBORNE 10.6 MICRON PULSED DOPPLER LIDAR SYSTEM Contractor Rept., 30 Jul. 1984 - 29 Jul. 1985

G. D. Emmitt Washington NASA May 1985 50 p ref

(Contract NAS8-35597)

(NASA-CR-3898; NAS 1.26:3898) Avail: NTIS HC A04/MF A01 CSCL 04B

The capability of a unique Airborne Doppler Lidar System to measure the horizontal winds in the vicinity of severe storm activity is demonstrated. The Airborne Doppler Lidar System (ADLS), developed at NASA/MSFC, was flown on a CV990 research aircraft during the CCOPE (Cooperative Convective Precipitation Experiments, Montana, Summer 1981). Flown between 400 and 600 m AGL, the lidar probed the subcloud regions of several deep convection storms. ADLS data collected near storms on 21 and 23 July 1981 are presented along with satellite imagery, radar echo maps and surface station measurements. These case studies are evidence of the successful performance of an airborne remote wind sensing system and the advantages of two dimension flow visualization of storm outflow structures and interactions. R.J.F.

N85-28512*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.

WATER VAPOR RADIOMETRY RESEARCH AND DEVELOPMENT PHASE Final Report

G. M. Resch, M. C. Chavez, N. L. Yamane, K. M. Barbier, and R. C. Chandlee 1 Apr. 1985 131 p refs

(Contract NAS7-918)

(NASA-CR-175887; JPL-Pub-85-14; NAS 1.26:175887) Avail: NTIS HC A07/MF A01 CSCL 04B

This report describes the research and development phase for eight dual-channel water vapor radiometers constructed for the Crustal Dynamics Project at the Goddard Space Flight Center, Greenbelt, Maryland, and for the NASA Deep Space Network. These instruments were developed to demonstrate that the variable path delay imposed on microwave radio transmissions by atmospheric water vapor can be calibrated, particularly as this phenomenon affects very long baseline interferometry measurement systems. Water vapor radiometry technology can also be used in systems that involve moist air meteorology and propagation studies. Author

N85-28513*# Information and Control Systems, Inc., Hampton, Va.

SOLAR RADIANCE MODELS FOR DETERMINATION OF ERBE SCANNER FILTER FACTOR Interim Report

R. F. Arduini May 1985 46 p refs

(Contract NAS1-17425)

(NASA-CR-172595; NAS 1.26:172595; Rept-685101) Avail: NTIS HC A03/MF A01 CSCL 04A

Shortwave spectral radiance models for use in the spectral correction algorithms for the ERBE Scanner Instrument are provided. The required data base was delivered to the ERBe Data Reduction Group in October 1984. It consisted of two sets of data files: (1) the spectral bidirectional angular models and (2) the spectral flux modes. The bidirectional models employ the angular characteristics of reflection by the Earth-atmosphere system and were derived from detailed radiance calculations using a finite difference model of the radiative transfer process. The spectral flux models were created through the use of a delta-Eddington model to economically simulate the effects of atmospheric variability. By combining these data sets, a wide range of radiances may be approximated for a number of scene types. Author

N85-28514# Finnish Meteorological Inst., Helsinki.

PRECIPITATION AND SNOW COVER DATA, 1977

1984 109 p

(ISBN-951-697-215-2; ISSN-0076-6755) Avail: NTIS HC A06/MF A01

Observations on precipitation in Finland in 1977, and snow observations for winter 1976 to 1977 were recorded. Precipitation recordings daily precipitation recordings and reports on the nature of the precipitation from 108 stations data from the stations, and other tables are presented. The tabulated data include monthly and annual precipitation, maximum diurnal precipitation, the data of the latter, the number of days with rain in excess of 0.1, 1.0 and 10.0 mm and the number of days with snow or sleet in excess of 0.1 mm. The stations are given in two lists (1) alphabetical order, note: the letters X and O come at the end of the Finnish alphabet, 2) in order of computer system symbols. E.A.K.

N85-28515# Danish Meteorological Inst., Copenhagen.

STATISTICAL INTERPRETATION OF THE ECMWF MODEL USING MOS TO PREDICT SURFACE WIND AND TEMPERATURE

Peter Aakjaer, Torben Strunge Pedersen, and Carsten Simonsen 1984 118 p refs

(WSR-2; ISBN-87-7478-233-9) Avail: NTIS HC A06/MF A01

Statistical forecasts based on model output statistics (MOS) using the ECMWF global numerical model as input are presented. A stepwise regression procedure is used to forecast temperature and wind. Both mean and maximum/minimum temperature for stations in southern Jutland are forecasted up to 6 days ahead, wind forecasts up to 3 days ahead. Temperature forecasts were also produced by empirical orthogonal functions. The operational forecasts to NGS are verified, and comparisons to other MOS projects are shown. E.A.K.

N85-28516# National Severe Storms Lab., Norman, Okla.

AUTOMATIC DETECTION OF GUST FRONTS Final Report

Hiroshi Uyeda and Dusan S. Zrnic Apr. 1985 65 p refs

(Contract DTFA01-80-Y-10524)

(FAA/PM-85-11) Avail: NTIS HC A04/MF A01

A procedure was developed that detects and tracks gust fronts automatically. It does not rely on a single method but requires simultaneous operation of two related algorithms. The convergence algorithm measures radial convergence and hence only gusts propagating along radials can be readily detected. The mesocyclone shear algorithm measures azimuthal shear and is suitable for detecting gusts parallel with radials as well as low level vortices. Long shear lines that these algorithms detect are classified as gusts whereas symmetric shear features are rejected if their shear and momentum are insignificant; otherwise they are classified as low level vortices. To track gusts, second order polynomials in the range azimuth plane are used. It is shown that predicted gust locations from simple linear projections of the least square fitted curves agree very well with actual gust locations. R.J.F.

N85-28517*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

POTENTIAL CLIMATIC IMPACTS OF INCREASING ATMOSPHERIC CO2 WITH EMPHASIS ON WATER AVAILABILITY AND HYDROLOGY IN THE UNITED STATES

David Rind and Sergej Lebedeff Apr. 1985 109 p refs Sponsored in part by EPA
(NASA-TM-87479; NAS 1.15:87479; EPA-230/04-84-006) Avail: NTIS HC A06/MF A01 CSCL 04B

The increase of CO2 in the atmosphere resulting from fossil fuel combustion is expected to have a profound climatic effect, due to the ability of carbon dioxide to absorb radiation emitted from the Earth atmosphere system. This report analyzes the hydrologic changes over the North American continent that were produced by doubling the carbon dioxide in the Goddard Institute for Space Studies (GISS) general circulation model. The first section describes the model and provides a comparison between the model output and the actual current climate. The changes that the model produces with a doubling of the atmospheric carbon dioxide are then presented. The second section attempts to put the results in perspective by examining historical variations in precipitation. DOE

N85-28518# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
METEOROLOGY AND FOOD PRODUCTION: THE THEME OF THE 16 METEOROLOGY DAY
M. Molga 22 Feb. 1985 9 p Transl. into ENGLISH from Gazeta Obserwatora IMGW, (Poland), v. 29, (339), no. 3, Mar. 1976 p 3-5
(AD-A152372; AD-E900434; FTD-ID(RS)T-1440-84) Avail: NTIS HC A02/MF A01 CSCL 04/2

This translation of a 1976 article from Poland focuses on the importance of meteorological services to agriculture. GRA

N85-28519# Air Force Environmental Technical Applications Center, Scott AFB, Ill.
AIR WEATHER SERVICE (AWS) CLIMATIC BRIEFS: EUROPE Data Summary
Dec. 1984 333 p Supersedes USAFETAC/DS-81/056
(AD-A152528; USAFETAC/DS-84/019) Avail: NTIS HC A15/MF A01 CSCL 04/2

AWS Climatic Briefs provide summarized monthly and annual climatic data for specific locations. Different data summaries provide information for different geographical areas. These areas are: North America (including Greenland and Bermuda); Latin America (including Mexico, the West Indies, and dependent islands); USSR and Mongolian Peoples Republic of China (no Climatic Briefs at this time); Asia (Turkey, and Cyprus to Indonesia and Japan); Africa (including Malagasy); and Antarctica, Australia, and Oceania. Meteorological elements included are: Temperature, precipitation, relative humidity, vapor pressure, dew point, pressure altitude, surface wind, mean cloud cover, thunderstorm and fog days, flying weather, and typhoon and hurricane data. Originator supplied keywords include: Meteorology; Weather; Climatology; Climatic Briefs; Temperature; Precipitation; Surface wind; Relative humidity; Dew point; Vapor pressure; Pressure altitude; Mean cloud cover; Flying weather; Thunderstorms; Fog; Belgium; East Germany; Federal Republic of Germany; France; Greece; Iceland; Italy; Netherlands; Norway; Portugal; Spain; United Kingdom; Climate; Wind; Cyprus; Denmark; Europe. GRA

N85-28520# Naval Postgraduate School, Monterey, Calif.
SPECTRAL DECOMPOSITION AND VERIFICATION OF NOGAPS 500MB MEDIUM-RANGE FORECASTS M.S. Thesis
R. C. Showalter Sep. 1984 96 p
(AD-A152550) Avail: NTIS HC A05/MF A01 CSCL 04/2

A major goal in the atmospheric sciences is accurate and reliable numerical weather prediction. An important aspect of numerical model development is verification studies which can isolate model strengths or weaknesses and indicate errors which must be eliminated. This thesis investigates the Navy Operational Global Atmospheric Prediction System (NOGAPS) model forecasts of the position and movement of waves at the 500mB level. Twelve NOGAPS 500mB 5-day forecasts were spectrally decomposed into wavenumber groupings for verification purposes. Four forecasts were from the NOGAPS 2.0 (6-level) version and eight from the NOGAPS 2.1 (9-level) version. Wavenumber components of the forecast and observed waves were grouped into planetary (wavenumbers 1-3), long (wavenumbers 4-7) and medium (wavenumbers 8-12) to facilitate model comparison. Hovmoller (time-longitude) diagrams were used to analyze the observed and forecast fields. Two systematic errors emerged; amplitude smoothing of wave and trough features, and consistent positive error at high latitudes. NOGAPS 2.1 demonstrated modest improvement (over NOGAPS 2.0) as error magnitudes were reduced and initiation of error occurred later in the forecast. GRA

N85-28521# Lincoln Lab., Mass. Inst. of Tech., Lexington.
WEATHER RADAR STUDIES Quarterly Technical Summary Report, 1 Jul. - 30 Sep. 1984
J. E. Evans 30 Sep. 1984 37 p Original contains color illustrations
(Contract F19628-85-C-0002; Grant DOT-FA01-80-Y-10546)
(AD-A152563; DOT/FAA/PM-85-03) Avail: NTIS HC A03/MF A01 CSCL 04/2

The test-bed Doppler weather radar was moved to the Olive Branch, Mississippi test site in early July. System integration and testing at Olive Branch commenced in mid-July. In late August, two lightning strikes damaged the mount electronics, computers, and signal-processing electronics. Most of September was spent in assessing and repairing the damage as well as installing an improved lightning protection system. The other principle weather measurement sensors (Lincoln mesonet, Memphis airport LLWSAS, and University of North Dakota C-band weather radar) obtained useful data in the July to September time period. These data and data from the National Center for Atmospheric Research JAWS program and the National Severe Storms Laboratory are being analyzed to determine wind-shear detection algorithms. Clutter measurements were carried out at the Dallas-Ft. Worth airport. Work continued on development of Doppler-radar-derived weather products for the Central Weather Processor. This work focused on optimization for algorithms for producing layered reflectivity and turbulence fields, and products for depicting the three-dimensional structure of storm fields. GRA

N85-28522# Institute for Defense Analyses, Alexandria, Va.
PRESENTATIONS AT THE TRI-SERVICE CLOUD MODELING WORKSHOP (2ND), HELD AT THE NAVAL SURFACE WEAPONS CENTER, WHITE OAK, MARYLAND, 26-27 JUNE 1984, VOLUME 1 Final Report
E. Bauer Aug. 1984 652 p Workshop held in White Oak, Md., 26-27 Jun. 1984
(Contract MDA903-84-C-0031)
(AD-A152735; AD-E500705; IDA-M-9-Vol-1;
IDA/HQ-84-28971-Vol-1) Avail: NTIS HC A99/MF A01 CSCL 04/2

The Second Tri-Service Cloud Modeling Workshop was held at Naval Surface Weapons Center, White Oak, MD, on 26-27 June 1984. Presentations were made on the current status of cloud data and cloud impact models and on needs for a variety of DoD applications. This document presents briefing charts for the presentations and related introductory and summarizing material. The preparation of this document was supported by DARPA/DEO. GRA

N85-28523# Aeronautical Research Associates of Princeton, Inc., N. J.
PARAMETERIZATION OF SUBGRID-SCALE FLUXES IN MESOSCALE METEOROLOGICAL MODELS Final Report
W. S. Lewellen, R. I. Sykes, and S. F. Parker Dec. 1984 121 p
(Contract N00228-83-C-3073; NR Proj. F59-551)
(AD-A153016; ARAP-535; NEPRF-CR-84-10) Avail: NTIS HC A06/MF A01 CSCL 04/2

The problem of subgrid turbulent flux parameterization for mesoscale meteorological models is considered. A particular scheme is recommended, based on a quasi-equilibrium approximation to the A.R.A.P. second-order closure model of turbulent transport in the atmosphere. Tests of this scheme, as compared with results from a full second-order closure, high resolution, 1-D model, indicate reasonable results when the model grid resolution is adequate to include a few points in the unstable boundary

layer. The scheme incorporates parameterization as an integral part of the quasi-equilibrium, and suggests that intermittency is a fundamental feature of cumulus cloud environment. Further testing of the scheme is recommended, particularly for the cumulus parameterization. GRA

N85-28524# Colorado State Univ., Fort Collins. Dept. of Atmospheric Science.
CHARACTERISTICS OF NORTH INDIAN OCEAN TROPICAL CYCLONE ACTIVITY Final Contractor Report
C. S. Lee and W. M. Gray Dec. 1984 114 p
(Contract N00228-83-C-3122)
(AD-A153085; NEPRF-CR-84-11) Avail: NTIS HC A06/MF A01 CSCL 04/2

Characteristics of North Indian Ocean tropical cyclones are discussed from a combined climatological, composite, and individual-case perspective. Presented are both a general discussion of the monthly climatology of these spring/autumn tropical cyclones and a comparison of their structure, genesis, intensity, and movement with these qualities of northwest Pacific Ocean tropical cyclones. Detailed individual case analyses are made of each North Indian Ocean tropical cyclone that occurred during the First Global GARP Experiment (FGGE) period. Each tropical cyclone's characteristics from genesis to decay are discussed. All data sources of the FGGE year period were consulted, including the analysis of the European Center for Medium Range Weather Forecasts (ECMWF). GRA

N85-28525# Oak Ridge National Lab., Tenn. Environmental Sciences Div.
TIME-DEPENDENCE OF CO2-INDUCED CLIMATE CHANGE
K. H. Cook 1985 2 p refs Presented at the 3rd Conf. on Climate Variations, Los Angeles, 8 Jan. 1985
(Contract DE-AC05-84OR-21400)
(DE85-007568; CONF-850132-2) Avail: NTIS HC A02/MF A01

An intermediate-level, primitive equation climate model designed to explore the relationships between steady-state and time-dependent simulations of CO2-induced climate change is described. DOE

N85-28526# Oregon State Univ., Corvallis. Dept. of Atmospheric Sciences.
MATHEMATICAL MODELING AND SIMULATION OF CLIMATE AND CLIMATIC CHANGE
Michael E. Schlesinger May 1984 94 p refs Lecture presented at Inst. d'Astronomie et de Geophysique, Universite Catholique de Louvain, Belgium
(Contract DE-AM06-70RL-02227)
(DE85-008974; DOE/RL-02227/T2) Avail: NTIS HC A05/MF A01

Mathematical climate models were developed as tools to integrate and test the knowledge of the Earth's climatic system as obtained from observations and theoretical hyptheses. Three types of climate models are described: (1) the energy balance model (EEM); (2) the radiantive convective model (RCM); and (3) the general circulation model (GCM). The design, evaluation and application of atmospheric and oceanic GCMs is presented in some detail. The evaluation and calibration of such models is illustrated by a simulation of the present climate by the Oregon State University (OSU) atmospheric GCM. It is shown that this model simulates contemporary climate with some fidelity but not without error. The appliation of mathematical climate models to quantitatively assess climate change hypotheses is illustrated by a simulation of CO2 induced climatic change with the OSU atmospheric GCM coupled with a simple ocean sea ice model. This and other simulations suggests that mathematical climate models can be usefully applied to increase the understanding of climate and climatic change. DOE

N85-28527# Technische Hogeschool, Delft (Netherlands). Dept. of Electrical Engineering.
RADAR STUDY OF THE MELTING LAYER
L. P. Lighthart, L. R. Nieuwkert, and A. W. Dissanayake (European Space Technology Center) Paris ESA Nov. 1983 53 p refs
(Contract ESTEC-5482/83/NL-GM(SC))
(ESA-CR(P)-1974) Avail: NTIS HC A04/MF A01

The use of FM continuous wave radar to study the melting layer in slant path propagation studies for satellite communication at frequencies > 10 GHz was tested. Results show that statistically meaningful parameters for the melting layer can be derived for rain rates < 10 mm/hr. These parameters can be used with a model to evaluate radio system design parameters. With high rain rates convective activity makes the melting layer less well defined and modeling more challenging. Particle breakup at the bottom of the layer must be taken in to account. Author (ESA)

N85-28528# National Oceanic and Atmospheric Administration, Miami, Fla. Oceanographic and Meteorological Labs.
AIRBORNE RESEARCH METEOROLOGICAL DATA COLLECTED BY THE NATIONAL HURRICANE RESEARCH LABORATORY (HURRICANE RESEARCH DIVISION/AOML) DURING THE 1982-1983 HURRICANE SEASONS: INVENTORY AND AVAILABILITY
H. A. Friedman, C. A. Amhols, N. M. Dorst, C. J. Nelson, and W. J. Brown Nov. 1984 168 p refs
(PB85-163681; NOAA-DR-ERL-AOML-3) Avail: NTIS HC A08/MF A01 CSCL 04B

Increased data reliability, innovative automated and interactive data processing and analysis capabilities, and new instrumentation systems, such as airborne Doppler radar, have rekindled the interests of many government and university scientists in using these new data sets for hurricane research. Author (GRA)

48 OCEANOGRAPHY

Includes biological, dynamic and physical oceanography; and marine resources.

N85-28529*# Jet Propulsion Lab., California Inst. of Tech., Pasadena. West Coast Satallite Time Series Advisory Group.
TOWARDS A STUDY OF SYNOPTIC-SCALE VARIABILITY OF THE CALIFORNIA CURRENT SYSTEM
1 Apr. 1985 43 p refs
(Contract NAS7-918)
(NASA-CR-175871; JPL-Pub-85-22; NAS 1.26:175871) Avail: NTIS HC A03/MF A01 CSCL 08C

A West Coast satellite time series advisory group was established to consider the scientific rationale for the development of complete west coast time series of imagery of sea surface temperature (as derived by the Advanced Very High Resolution Radiometer on the NOAA polar orbiter, and near-surface phytoplankton pigment concentrations (as derived by the Coastal Zone Color Scanner on Nimbus 7). The scientific and data processing requirements for such time series are also considered. It is determined that such time series are essential if a number of scientific questions regarding the synoptic-scale dynamics of the California Current System are to be addressed. These questions concern both biological and physical processes. E.A.K.

N85-28530# Woods Hole Oceanographic Institution, Mass.
MODERN SEDIMENTATION IN THE NORTHERN BARENTS SEA: INPUT, DISPERSAL AND DEPOSITION OF SUSPENDED SEDIMENTS FROM GLACIAL MELTWATER Ph.D. Thesis
S. L. Pfirman Jan. 1985 382 p
(Contract N00014-81-C-0009)
(AD-A152520; WHOI-85-4) Avail: NTIS HC A17/MF A01 CSCL 08/10

Contents: Water Masses of the Northern Barents Sea; Surface Sediment Response to Hydrographic Regime: The Northern Barents Sea; Sea-Floor Morphology Outside a Grounded, Surging Glacier: Brasvellbreen, Svalbard; Input, Dispersal, and Deposition of Glacial Sediments from Meltwater Plumes; Hydrographic Data; Surface Sediment Data; Suspended Matter Data. GRA

N85-28531# Royal Netherlands Meteorological Inst., De Bilt. Physical Meteorology.
OBSERVATIONS OF SURFACE WATER TEMPERATURE IN THE NETHERLANDS SINCE 1860: STATISTICS
P. C. T. vanderHoeven 1984 131 p refs In DUTCH; ENGLISH summary
(KNMI-WR-84-3; ISSN-0169-1651) Avail: NTIS HC A07/MF A01
The statistical properties of over 3000 station years of sea surface temperature measurement for the North Sea are described. Author (ESA)

N85-28532# Royal Netherlands Meteorological Inst., De Bilt. Physical Meteorology.
OBSERVATIONS OF SURFACE WATER TEMPERATURE IN THE NETHERLANDS SINCE 1860: TABLES FOR LIGHT VESSELS
P. C. T. vanderHoeven 1984 121 p refs In DUTCH; ENGLISH summary
(KNMI-WR-84-4; ISSN-0169-1651) Avail: NTIS HC A06/MF A01
Monthly means of North Sea surface temperature variations are presented. Author (ESA)

N85-28533# Royal Netherlands Meteorological Inst., De Bilt. Physical Meteorology.
OBSERVATIONS OF SURFACE WATER TEMPERATURE IN THE NETHERLANDS SINCE 1860: SERIES FROM KNMI-RWS
P. C. T. vanderHoeven 1984 87 p refs In DUTCH; ENGLISH summary
(KNMI-WR-84-5; ISSN-0169-1651) Avail: NTIS HC A05/MF A01
Monthly means of North Sea surface temperature variations are presented. Author (ESA)

51 LIFE SCIENCES (GENERAL)

Includes genetics.

N85-28534# Letterman Army Inst. of Research, San Francisco, Calif. Div. of Ocular Hazards.
M-BLASER: A DEVICE TO STUDY PURSUIT TRACKING IN THE RHESUS MONKEY Final Report, Nov. 1980 - Oct. 1982
V. J. Pribyl, A. Edwards, D. J. Lund, H. Zwick, and P. OMara Feb. 1985 19 p
(DA Proj. 3M1-61102-BS-10)
(AD-A152986; LAIR-85-54) Avail: NTIS HC A02/MF A01 CSCL 06/3
An apparatus was constructed for the study of pursuit tracking in rhesus monkeys. Two rhesus were trained to track successfully a target moving at 5 milliradians (mrad) per sec (0.29 deg per sec) with an accuracy of + or - 7.5 mrad (0.43 deg) for 20 sec. For one monkey, vision was occluded for 1, 2, or 3 sec during a tracking trial. Tracking continued within 7.5 mrad from 0.48 to 3.24 sec. GRA

N85-28535# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
ENCAPSULATION AND PACKAGING OF A SEMICONDUCTOR MULTIELECTRODE ARRAY FOR CORTICAL IMPLANTATION M.S. Thesis
R. R. Turner Dec. 1984 174 p
(AD-A153180; AFIT/GCS/ENG/84D-30) Avail: NTIS HC A08/MF A01 CSCL 06/2
A 16 x 16 multielectrode semiconductor array, known as the AFIT brain chip, must be encapsulated prior to implantation into the cerebral cortex of a rhesus monkey. The encapsulant, which must protect the chip from the saline-like solution of the cerebrospinal fluid, was a polyimide: Dupont PI 2555. The polyimide was spun onto the chip, and the electrode openings etched, using negative photolithography and wet chemical etching. An eight-micron thick layer of polyimide was obtained by repeating this process several times. Although actual implantation was not performed, an implantable package was designed and fabricated which will allow for chronic use with only one surgical operation. A surgical technique for implanting the package is suggested. The fabricated package was not fully functional, however, because an epoxy used to protect bond wires from the stress of the polyimide could not withstand the high temperature cure. The functioning part of the chip was tested in vitro and worked continuously for three weeks. There was no damage to the polyimide encapsulant, but some of the aluminum electrodes showed signs of deterioration. GRA

N85-28536# Michigan Univ., Ann Arbor. Biological Station.
PHOTOSYNTHETIC ACCLIMATION OF ACER SACCHARUM Annual Progress Report
David M. Gates 1985 17 p refs
(Contract DE-AC02-76EV-02164)
(DE85-008247; DOE/EV-02164/11; APR-11) Avail: NTIS HC A02/MF A01
The overall goal of our research program was to understand the effect of variations in the characteristics of whole-leaf CO2 exchange on productivity of plants and plant communities. To this end we measured CO2 exchange as a function of major environmental factors, emphasizing irradiance, temperature, and CO2 concentration. In addition we determined the effect of O2 on photosynthesis, because of the major impact O2 has on net carbon gain during photosynthesis. We tested various models for their ability to simulate the daily response of CO2 exchange measured in the field. These studies convinced us that we have adequate modeling capacity for simulation of daily time courses under natural conditions. During the past three years we have made progress on several projects related to gas exchange, particularly CO2 exchange, in leaves. The primary emphasis has been on the analysis and modeling of daily CO2 exchange in Acer saccharum seedlings. More recently we have been emphasizing the investigation of the photosynthetic response of Populus gradident. Data has also been collected on a number of other species in order to test the generality of some of the responses noted in the intensive studies. DOE

N85-28537# Illinois Univ., Urbana. Dept. of Dairy Science.
FATTY AND AROMATIC ACID CATABOLIZING BACTERIA FROM METHANOGENIC ECOSYSTEMS Annual Technical Progress Report
Marvin P. Bryant and John J. Kammerer 27 Feb. 1985 4 p
(Contract DE-AC02-81ER-10874)
(DE85-008133; DOR/ER-10874/4) Avail: NTIS HC A02/MF A01
A long-chain fatty acid degrading (beta oxidizing), obligate proton-reducing, acetogenic bacterium strain SD2 of the genus Syntrophomonas was isolated in coculture with a hydrogen-using bacterium, Desulfovibrio strain G-11. The enzymology of fatty acid degradation is being studied to discover the differences of SD2 from S. Wolfei which allow it to degrade long chain fatty acids. A new species, Clostridium pfennigii (V5-2) was isolated from the rumen. A new genus and species, Syntrophococcus sucromutans (S195) is present in relatively high numbers in rumen contents. Another new species is Eubacterium oxidoreducens. DOE

N85-28538# Center for Mathematics and Computer Science, Amsterdam (Netherlands). Dept. of Applied Mathematics.
THE DYNAMICAL BEHAVIOR OF THE AGE-SIZE-DISTRIBUTION OF A CELL POPULATION
H. J. A. M. Heijmans Oct. 1984 29 p refs Submitted for publication
(CWI-AM-R8414; B8478807) Avail: NTIS HC A03/MF A01
The model proposed by Bell and Anderson describing the dynamics of a proliferating cell population, which assumes that the individual's behavior is completely determined by its age and size is studied. By the method of integration along characteristics, the problem is reduced to a renewal type integral equation. Using Laplace transform techniques and results from positive operator theory, the large time behavior of the solution can be described if a condition on the growth rate is imposed. Author (ESA)

N85-28182# Joint Publications Research Service, Arlington, Va.
PROGRESS, GOALS IN BIOTECHNOLOGY SUMMARIZED

In its East Europe Rept.: Sci. and Technol. (JPRS-ESA-85-017) 2 May 1985 p 54-56 Transl. into ENGLISH from Nepszabadsag (Budapest), 13 Mar. 1985 p 5 (For primary document see N85-28177 17-31)
Avail: NTIS HC A05/MF A01

52 AEROSPACE MEDICINE

Includes physiological factors; biological effects of radiation; and weightlessness.

N85-28539# American Inst. of Biological Sciences, Arlington, Va.
BIOLOGICAL AND HUMAN HEALTH EFFECTS OF EXTREMELY LOW FREQUENCY ELECTROMAGNETIC FIELDS. POST-1977 LITERATURE REVIEW Final Report, 1977 - 1984
Mar. 1985 361 p
(Contract N00014-84-C-0446)
(AD-A152731; AD-E440275) Avail: NTIS HC A16/MF A01 CSCL 06/18

An evaluation of the applicable literature conducted by scientific and engineering experts assembled by the A I B S was completed for the 1977-1984 period. The expert committee concluded from their evaluation that electromagnetic field exposure associated with the U.S. Navy's Extremely Low Frequency (ELF) Communication System is unlikely to produce adverse public health effects or adverse effects on plants and animals. Information included in this report pertains to Coupling of Living Organisms to ELF Electric and Magnetic Fields; Possible Biophysical Mechanisms of Electromagnetic Interactions with Biological Systems; Biological Effects of ELF Magnetic Fields; Cellular Studies of Effects of ELF Electric and Magnetic Fields; Interaction of ELF Electric and Magnetic Fields with Neural and Neuroendocrine Systems; Hematologic and Immunologic Effects of Extremely Low Frequency Electromagnetic Fields; Reproductive and Developmental Effects in Mammalian and Avian Species from Exposure to ELF Fields; Human Studies of Carcinogenic, Reproductive, and General Health Effects of ELF Fields; Potential Effects on Natural Biota of Operating an Extremely Low Frequency Communications System; and Extremely Low Frequency (ELF) Communications System and Its Electromagnetic Fields. GRA

N85-28540# Florida Univ., Gainesville.
SLEEP DEPRIVATION AND PERFORMANCE: OLDER AGE PERFORMANCE AND LIMITED SLEEP PERIOD USE Final Report, 1 Aug. 1981 - 31 Aug. 1983
W. B. Webb May 1984 34 p
(Contract DAMD17-81-C-1136; DA Proj. 3E1-62777-A-879)
(AD-A153102) Avail: NTIS HC A03/MF A01 CSCL 06/19

The purposes of these experiments were to assess the effects of three variables on performance in extended periods of time without sleep: the effects of prior repetition of performance in such conditions, the effects of age and the effects of limited interjected sleep periods. A computer-based battery of performance tasks as used which included subjective measures, short and long term monitoring tasks, continuous production tasks, precision measures, and an extensive battery of cognitive tests. Repetition of extended performance across 48 hours without sleep at four monthly intervals did not offset performance decrements. Where effects were obtained, performance decrements were enhanced. In two experiments with 40-50 year old subjects and 50-60 year old subjects in extended performance of forty-eight hours without sleep, where differences were obtained, older subjects showed a greater performance degradation. Three schedules of interjected naps within a 72 hour period were used: two hour naps prior to the second and third night period, two hours naps following the first and second night period; and a single four hour nap prior to the second night. Limited counter degradation effects were found in the final period of performance. The largest decrements on measures were found in subjective measures, vigilance tasks, and continuous production tasks. More limited decrements or no decrements were found in the cognitive tasks and the precision measures. GRA

N85-28541# Letterman Army Inst. of Research, San Francisco, Calif.
PURSUIT TRACKING PERFORMANCE AND FLASH DISRUPTION: THE EFFECTS OF TRAINING THE NON-DOMINANT EYE ON TARGET REACQUISITION Final Report, Mar. - Jul. 1984
J. W. Molchany, D. A. Stamper, and R. R. Levine Feb. 1985 22 p
(AD-A153404; AD-E801113; LAIR-196) Avail: NTIS HC A02/MF A01 CSCL 17/8

Shifting from the sighting to the non-sighting eye represents a possible solution for operators of monocular viewing devices whose vision is temporarily disrupted from the effects of flash. Twenty-four male volunteers used a viscous-damped mount optical tracking device to track targets at a constant angular velocity of 5 mrad/sec under bright and dim ambient light conditions. Pursuit tracking data were collected under simulated field conditions. Volunteers were randomly assigned to one of the three groups. The first group received no training of the non-sighting eye. The second group received training with both the sighting and non-sighting eyes, individually. The third group was trained in the same manner as the second group, except that they were also trained to switch eyes during tracking trials. On the test day, a monocular full field flash was used. The volunteers were instructed to switch eyes and reacquire the target with the non-sighting eye to complete the task. Analysis of Variance for horizontal RMS error scores revealed no significant group main effect for either the sighting eye baseline or the non-sighting eye baseline. The maximum absolute error scores for Group 3 under both bright and dim ambient light conditions were significantly better than Groups 1 and 2. It was concluded that training monocular devices operators to switch from the sighting to the non-sighting eye following disruption of pursuit tracking represents a temporary solution to the debilitating effects of flash blindness. Author (GRA)

N85-28542# Oak Ridge National Lab., Tenn.
CHEMICALS IDENTIFIED IN HUMAN BIOLOGICAL MEDIA, A DATA BASE, VOLUME 6, PART 1 Annual Report, Oct. 1983
M. V. Cone, comp., M. F. Baldauf, comp., D. M. Opresko, comp., M. S. Uziel, comp., and B. Chilton, comp. Apr. 1984 456 p refs
(DE85-008768; ORNL/EIS-163-Vol-6-Pt-1; EPA-560/5-83-012-Vol-6-Pt-1; AR-5) Avail: NTIS HC A20/MF A01

A comprehensive data base of chemicals identified in human biological media (tissues and body fluids) has been established under the direction of the Environmental Protection Agency's Office of Toxic Substances Exposure Evaluation Division. This centralized resource of body-burden information was inspired by the concern of government scientists over continuing reports of toxic chemicals in human tissues and body fluids. Data were obtained primarily from the open literature through manual searches of selected journals. The file contains information on over 1000 chemicals that have been found in human biological media. DOE

53 BEHAVIORAL SCIENCES

Includes psychological factors; individual and group behavior; crew training and evaluation; and psychiatric research.

N85-28543# Naval Biodynamics Lab., New Orleans, La.
PERFORMANCE EVALUATION TESTS FOR ENVIRONMENTAL RESEARCH (PETER) EVALUATION OF 112 MEASURES
A. C. Bittner, Jr., R. C. Carter, R. S. Kennedy, M. M. Harbeson, and M. Krause Sep. 1984 32 p
(AD-A152317; NBDL-84R006) Avail: NTIS HC A03/MF A01 CSCL 05/10

The goal of the Performance Evaluation Tests for Environmental Research (PETER) Program was to identify a set of measures

of human cognitive, perceptual, and motor capabilities for use in the study of environmental and other time-course effects. Tasks were evaluated as suitable for repeated measures applications when their intertrial means, variances, and correlations were well-behaved under constant baseline conditions. The results of this program are documented in more than 90 reports. This report provides an evaluation of 112 measures studied in the PETER Program. They are categorized into four groups based upon consideration of task stability and task definition. The Recommended category contained 30 measures that clearly obtained total stabilization and had an acceptable level of reliability efficiency (i.e., rxx greater than .50, normalized to a three minute administration). The Acceptable-But-Redundant category contained 15 measures that met the same requirements as those in the Recommended category but were found redundant. The 35 measures in the Marginal category usually had desirable features which were outweighted by faults. The 32 measures in the Unacceptable category were characterized by either differential instability or weak reliability efficiency (rxx less than .15). GRA

N85-28544# Naval Aerospace Medical Research Lab., Pensacola, Fla.

THE LEVELS OF PROCESSING CONCEPTUALIZATION OF HUMAN MEMORY: SOME EMPIRICAL AND THEORETICAL ISSUES

D. K. McBride Dec. 1984 26 p
(WR0421)
(AD-A152321; NAMRL-Monograph-31) Avail: NTIS HC A03/MF A01 CSCL 05/10

The consideration of human memory phenomena is an important element in the formation of any valid model of human performance where information storage and retrieval demands on the part of the operator are known to be substantial. Various conceptualizations of memory have enjoyed empirical success over the years. Perhaps the most popular class of such conceptualizations is characterized as multi-store. The fundamental tenants of this approach are that (a) information is submitted to a short-term store where capacity is limited and forgetting is explained on the basis of spontaneous decay and long-term store where failure to remember is posited as an interference effect. Models based on these principles have prevailed primarily because of the heuristic value of the computer analogies which serve as their iconic bases. There are significant logical and empirial problems associated with these paramorphic models, however. A relatively recent tack has provided an alternative approach towards embracing a wide range of memory findings. The levels-of-processing (LOP) framework was introduced by Craik and Lockhart in 1972, and it has attracted a growing audience of skeptics and adherents over the past decade. The fundamental assumption of LOP is that it is the level--depth, and spread--breadth, of information processing which determines retrieval strength. This monograph examines the strengths and weaknesses of this fresh approach to memory phenomena. GRA

N85-28545# Naval Aerospace Medical Research Lab., Pensacola, Fla.

DEVELOPMENT FACTORS AND FIELD DEPENDENCE-INDEPENDENCE Interim Report

L. S. Goodman Nov. 1984 20 p
(AD-A152337; NAMRL-1311) Avail: NTIS HC A02/MF A01 CSCL 05/9

The use of field dependence-field independence measures has been suggested for both the selection and classification of naval aviators. If measures of field dependence-field independence are predictive of pilot proficiency, the utility of the construct for selection and classification could be moderated by the influence of intraindividual changes in field dependence-field independence (FD-FI) over time. This report reviews (1) particulars of the field dependence-field independence construct, (2) evidence for and against age-related changes in field dependence-field independence, (3) intraindividual lability in field-dependence-field independence, and (4) various measurement, sampling, and experimental design concerns associated with investigations of the construct. Though great care may be taken to select subjects and statistically control known moderator variables in studies of FD-FI, it is often difficult, if not impossible, to impose appropriate selection and control procedures in a priori fashion. The simultaneous employment of cross-sectional and longitudinal sequences in data collection is best suited to the description of intraindividual changes in FD-FI with age. GRA

N85-28546# Texas A&M Univ., College Station. Dept. of Management.

THE RELATIONSHIP BETWEEN PERFORMANCE AND SATISFACTION: A UTILITY ANALYSIS

G. R. Jones and C. D. Fisher Mar. 1985 27 p
(Contract N00014-83-K-0388)
(AD-A152342; TR-ONR-8) Avail: NTIS HC A03/MF A01 CSCL 05/10

A utility analysis suggests that the performance-satisfaction relationship is curvilinear. Total utility (satisfaction) is expected to rise as performance increases, but at a diminishing rate. After some point total utility will decline with increases in performance, as the marginal utility associated with the last unit of performance becomes negative. This decline in satisfaction occurs because of the satiation of both intrinsic and extrinsic needs, and because the utility of leisure increases as it becomes increasingly scarce when more time and effort is devoted to work performance. Thus satisfaction and performance may be negatively related for high to very high levels of performance. Implications for encouraging and maintaining performance at the margin are presented. GRA

N85-28547# Naval Aerospace Medical Research Lab., Pensacola, Fla.

TECHNICAL EVALUATION OF THE NAVAL AUTOMATED PILOT APTITUDE MEASUREMENT SYSTEM (NAPAMS) Interim Report

M. Y. Eyraud, J. M. Owens, and L. S. Goodman Dec. 1984 18 p
(AD-A152361; NAMRL-SR-85-3) Avail: NTIS HC A02/MF A01 CSCL 05/9

A primary objective of engineering psychology research at the Naval Aerospace Medical Research Laboratory is the development of an aviation relevant, realistic, multitask performance data base. A continuum of approaches to data base development exists ranging from the conduct of numerous laboratory tasks to the use of full scale simulation techniques. The Naval Automated Pilot Aptitude Measurement System (NAPAMS), which incorporates a software-based low fidelity simulation of the Navy's T-34C aircraft, represents a performance assessment capability that is located somewhat closer to the full-scale simulation end of the continuum than to the endpoint defined by typical laboratory tasks. The present report summarizes the results of an evaluation of NAPAMS to assess its technical and experimental adequacy for use in performance data base development. GRA

N85-28548# Texas A&M Univ., College Station. Organizational Behavior Research.

PREDICTORS OF TRANSFER ADJUSTMENT: A LONGITUDINAL STUDY

J. B. Shaw, C. D. Fisher, and R. W. Woodman Jan. 1985 54 p
(Contract N00014-83-K-0388; F63-521)
(AD-A152462; AD-E440273; TR-ONR-7) Avail: NTIS HC A04/MF A01 CSCL 05/9

143 NCO's who had been notified of an upcoming Permanent Change of Station (PCS) were interviewed prior to moving. Three months after moving, 99 of these individuals returned follow-up questionnaires. Hypotheses were tested concerning premove, move, and post move determinants of post move adjustments to both the job and the location. Adjustment were found to be predicted by pre-move attitude toward the move, adjustment and satisfaction with previous moves, number of dependents, unmet expectations, perceived job advancement, and amount of information about new location received prior to moving. GRA

N85-28549# Carnegie-Mellon Univ., Pittsburgh, Pa. Robotics Inst.

IDENTIFYING SOLUTION PATHS IN COGNITIVE DIAGNOSIS Final Report

S. Ohlsson and P. Langley 1 Mar. 1985 58 p

(Contract N00014-83-K-0074)

(AD-A152463; AD-E440273; CMU-RI-TR-85-2) Avail: NTIS HC A04/MF A01 CSCL 05/10

Consider the problem of describing the thought processes of a human being with respect to how he solves a particular task. How can we infer his knowledge of the task and the procedure or strategy he is using to solve it from his performance? We will call this the problem of cognitive diagnosis. In this paper, we examine the cognitive diagnosis - inferring explanations of observed human behavior. We review previous approaches to cognitive diagnosis, focusing on the methodology of Newell and Simon (1972), which relies on the Newell (1980) problem space hypothesis. This approach proceeds in three stages: (1) identify the problem space in which the subject is operating; (2) identify the subject's path through the problem space; and (3) identify a set of rules that account for the steps along this path. We recount earlier work on automating the diagnostic process, and focus on methods for automating the second of the stages above - identifying the subject's solution path. We describe the Diagnostic Path-Finder (DPF), an AI system that uses heuristic search to hypothesize a solution path to account for a subject's behavior. Unlike most heuristic search systems, DPF employs psychological criteria to direct its search through the problem space. We examine DPR's performance in explaining errors on multi-column subtraction problems, and compare its explanations to those generated by Brown and Burton's (1978) DEBUGGY system. Finally, we discuss the advantages and limitation of our approach to automated cognitive diagnosis. Keywords include: cognitive diagnosis, problem spaces, production systems, machine learning, heuristic search, subtraction. GRA

N85-28550# RAND Corp., Santa Monica, Calif.

INDIVIDUAL CHARACTERISTICS AND UNIT PERFORMANCE: A REVIEW OF RESEARCH AND METHODS Interim Report

J. P. Kahan, N. Webb, R. J. Shavelson, and R. M. Stolzenberg Feb. 1985 124 p

(Contract MDA903-83-C-0047)

(AD-A153145; RAND/R-3194-MIL) Avail: NTIS HC A06/MF A01 CSCL 05/10

This study is an initial effort to understand how characteristics of individuals influence the effectiveness and efficiency with which the military units to which they belong perform their missions. It was undertaken as a systematic review of existing knowledge about the relationship between individual characteristics and group performance. It identified five general catagories of predictors of group performance: (1) individual characteristics (general ability, task proficiency, and personality characteristics); (2) leadership; (3) group structural composition, or the mix of individual characteristics; (4) group processes (cohesiveness, attraction); and (5) training techniques (feedback vs. individual performance). Among its conclusions, the study finds that the relationship between ability and performance depends on the nature of the task, and that feedback, both on level of the individual members' performance and on the level of unit performance, is very important. GRA

N85-28551# Minnesota Univ., Minneapolis. Cooperative Learning Centre.

THE IMPACT OF GROUP PROCESSING ON ACHIEVEMENT IN COOPERATIVE LEARNING GROUPS

S. Yager, R. T. Johnson, and D. W. Johnson 20 Feb. 1985 18 p

(Contract N00015-84-K-0009)

(AD-A153168; CLC-004) Avail: NTIS HC A02/MF A01 CSCL 05/10

The impact on achievement of: (1) cooperative learning in which members discussed how well their group was functioning and how they could improve its effectiveness, (2) cooperative learning without any group processing, and (3) individualistic learning were compared on daily achievement, post-instructional achievement, and retention. Eighty-four third-grade students were randomly assigned to the three conditions stratifying for sex and ability level. The results indicate that the high-, medium-, and low-achieving students in the cooperation with group processing condition achieved higher on all three measures than did the students in the other two conditions. Students in the cooperation without group processing condition, furthermore, achieved higher on all three measures than did the students in the individualistic condition. GRA

N85-28552# Minnesota Univ., Minneapolis. Cooperative Learning Center.

ORAL DISCUSSION, GROUP-TO-INDIVIDUAL TRANSFER AND ACHIEVEMENT IN COOPERATIVE LEARNING GROUPS

S. Yager, D. W. Johnson, and R. T. Johnson 20 Feb. 1985 26 p

(Contract N00014-84-K-0009)

(AD-A153209; CLC-005) Avail: NTIS HC A03/MF A01 CSCL 05/10

The effects of cooperative learning in which oral discussion was structured (to ensure oral summarization and the monitoring of others' summaries), cooperative learning in which oral discussion was unstructured, and individualistic learning were compared on daily achievement, post-instructional achievement, and retention. Seventy-five second grade students were randomly assigned to the three conditions stratifying for sex and ability level. The results indicate that students in cooperative groups performed significantly higher on the accuracy of daily work than do students working individualistically. In addition, the high-, medium-, and low-ability students in the structured oral discussion cooperative condition scored higher on the post-instructional and retention tests (which were taken individually) than did the students in the other two conditions, and the students in the unstructured oral discussion cooperative condition scored higher on these tests did the students who had learned individualistically. These results indicate that group-to-individual transfer does take place within cooperative learning groups and that orally summarizing the material being learned and the monitoring of others' summaries contributes to the efficacy of cooperative learning. GRA

N85-28553# Army Research Inst. for the Behavioral and Social Sciences, Alexandria, Va.

BIOFEEDBACK AND PERFORMANCE: AN UPDATE Final Technical Report, 1 Jul. - 30 Aug. 1984

G. H. Lawrence Dec. 1984 34 p

(DA Proj. 2Q1-61102-B-74-F)

(AD-A153228; ARI-TR-658) Avail: NTIS HC A03/MF A01 CSCL 05/10

To improve efficiency and quality of individual performance by assessing and evaluating the potential of biofeedback for development of relevant technology. The history of effects to use biofeedback for enhancement of human performance is reviewed, and a variety of recent research results are presented and critiqued. Internal events fed back to subjects include: several brain frequencies and events; EMG; heartrate; peripheral vasoconstriction, and other autonomic events; respiration. Performance is measured on tasks involving gross and fine motor control, response to a variety of induced stressors, cognitive and psychomotor behaviors, and athletics. Major conclusions indicate that when mediated via a diffuse hypothetical construct biofeedback has little effect upon performance. However, some promise exists for enhancement through learned control of carefully identified internal events related to specific dimensions of performance. GRA

N85-28554# Brown Univ., Providence, R. I. Center for Neural Science.

DISTRIBUTED MEMORY

L. N. Cooper 13 Mar. 1985 12 p

(Contract DAAG29-84-K-0202)

(AD-A153364; ARO-22000.1-LS) Avail: NTIS HC A02/MF A01 CSCL 06/16

A brief account is given of how a neural network can store a distributed content addressable memory. Some of the properties of such a network as well as a possible site of storage of long and short term memory are discussed. GRA

N85-28555# Minnesota Univ., Minneapolis. Cooperative Learning Center.
THE EFFECTS OF CONTROVERSY AND CONCURRENCE SEEKING ON EFFECTIVE DECISION MAKING
K. A. Smith, R. P. Petersen, D. W. Johnson, and R. T. Johnson 20 Feb. 1985 27 p
(Contract N00014-84-K-0009; NR Proj. RR0-4208)
(AD-A153370; CLC-003) Avail: NTIS HC A03/MF A01 CSCL 05/10

The effects of controversy and concurrence seeking were compared on effective decision making. Thirty-six students were randomly assigned to conditions and to groups of four within each condition. Subjects participated in a four-hour experimental session (two two-hour sessions two days apart), engaging in structured argumentation or avoiding disagreements while making a group decision, depending on the condition. The results indicate that controversy, compared with concurrence seeking, resulted in higher-level reasoning reflected in the decision, greater epistemic curiosity, and greater personal efficacy and commitment to the decision, with no damage to the quality of the relationships among group members. More orally active members were perceived as providing the most leadership. GRA

N85-28556# Bundesanstalt fuer Flugsicherung, Frankfurt am Main (West Germany).
GUIDELINES OF THE FEDERAL MINISTER OF TRANSPORTATION FOR THE FORMATION AND EXAMINATION OF AIRLINE PERSONNEL, PART 4 [RICHTLINIEN DES BUNDESMINISTERS FUER VERKEHR FUER DIE AUSBILDUNG UND PRUEFUNG DES LUFTFAHRTPERSONALS, HEFT 4]
Oct. 1984 165 p In GERMAN
Avail: NTIS HC A08/MF A01

The methods and extent of the formation and examination of airline personnel are outlined. Pilots' theoretical and practical instruction, extension or renewal of a type rating, tolerances to be respected during the flight, and certificate for instruction and examinations, are discussed. Theoretical and practical instruction and examination of instrument rating and long range rating are presented. Author (ESA)

N85-28557# Technische Hogeschool, Delft (Netherlands). Dept. of Aerospace Engineering.
PERCEPTION OF ROLL RATE FROM AN ARTIFICIAL HORIZON AND PERIPHERAL DISPLAYS
R. J. A. W. Hosman and J. C. vanderVaart Nov. 1983 25 p refs Presented at 19th Ann. Conf. on Manual Control, Cambridge, Mass., 23-25 May 1983
(VTH-LR-403) Avail: NTIS HC A02/MF A01

Perception accuracy of roll rate by subjects from a central CRT-display (simulated artificial horizon), peripheral side displays (moving checkerboard pattern) and both displays combined was investigated to see if peripheral displays improve performance by increasing arousal or by a more accurate or a faseter perception of roll rate. Discrete values of roll rate were presented to the subjects during exposure times between 0.1 and 0.8 sec. Immediately after stimulus exposure the displays were plainly blanked or masked by a dithering line on the central display or dithering of the checkerboard pattern on the peripheral displays. Results show that the roll rate perception process from peripheral displays is more accurate and up to 0.1 sec faster than from the central display. Masking has a different influence on central visual perception than on peripheral visual perception. Author (ESA)

N85-28558# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Hamburg (West Germany). Abt. Flugphysiologie und -psychologie.
CONSTRUCTION OF A JOB-ORIENTED TEST FOR THE SELECTION OF AIR TRAFFIC CONTROLLERS Thesis - Hamburg Univ.
Thomas Spohrer Oct. 1984 46 p refs In GERMAN; ENGLISH summary Report will also be announced as translation (ESA-TT-921)
(DFVLR-FB-84-51; ISSN-0171-1342) Avail: NTIS HC A03/MF A01; DFVLR, Cologne DM 17.50

The Approach Control Test (ACT) simulating air traffic control operations is a paper-pencil group test consisting in controlling the collision-free landing of two to three aircraft over check points in the Approach Control area. The test requires the use of a test map representing the approach control area, a tape or cassette recorder and a blackboard for occasional explanations. The test results prove the validity of the ACT used as a part of the psychological selection program for air traffic controllers. Author (ESA)

54 MAN/SYSTEM TECHNOLOGY AND LIFE SUPPORT

Includes human engineering; biotechnology; and space suits and protective clothing.

N85-28559*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
HAND CONTROLLERS FOR TELEOPERATION. A STATE-OF-THE-ART TECHNOLOGY SURVEY AND EVALUATION
T. L. Brooks and A. K. Bejczy 1 Mar. 1985 94 p refs
(Contract NAS7-918)
(NASA-CR-175890; JPL-Pub-85-11; NAS 1.26:175890) Avail: NTIS HC A05/MF A01 CSCL 05H

Hand controller technology for teleoperation is surveyed in three major catagories: (1) hand grip design, (2) control input devices, and (3) control strategies. In the first category, 14 hand grip designs are reviewed and evaluated in light of human factor considerations. In the second, 12 hand controller input devices are evaluated in terms of task performance, configuration and force feedback, controller/slave correspondence, operating volume, operator workload, human limitations, cross coupling, singularities, anthropomorphic characteristics, physical complexity, control/display interference, accuracy, technological base, cost, and reliability. In the third catagory, control strategies, commonly called control modes, are surveyed and evaluated. The report contains a bibliography with 189 select references on hand controller technology. Author

N85-28560# Department of the Air Force, Washington, D.C.
STABILIZING FORCE FEEDBACK IN BIO-ACTUATED CONTROL SYSTEMS Patent Application
D. W. Repperger, inventor (to Air Force) Filed 6 Feb. 1985 46 p
(AD-D011634; US-Patent-Appl-SN-698963) Avail: NTIS HC A03/MF A01 CSCL 05/8

Document describes a biomechanical feedback arrangement wherein a varying force tending to improve the neuromotor tracking response of a human subject, particularly in the presence of lateral or front-back G force fields, is added to the test subject input member of a closed loop feedback control system. Use of the biomechanical feedback in a high-performance aircraft and in a ground-based simulator apparatus is also disclosed, along with comparison results from simulator testing of human subjects. Author (GRA)

N85-28561# Gesamthochschule, Siegen (West Germany). Abt. Arbeitswissenschaft.
MECHANIZING OF HANDLING OPERATIONS IN DROP FORGING WITH HAMMERS AND PRESSES (CONDUCTED ERGONOMICAL EXAMINATIONS) Final Report, Dec. 1981
Herbert Schnauber, Michael Krombach, and Frank Peter Weigelt Bonn Bundesministerium fuer Forschung und Technologie Dec. 1984 88 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie

(BMFT-FB-HA-84-051; ISSN-0171-7618) Avail: NTIS HC A05/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 18.50

Ergonomical results for improvement of the negative effects of working conditions and environment in forging and forging-connected operations are reviewed. The working conditions at the hammer group and the press group completed by manipulators and robots are studied. The physical strains in forging hammer and press operations is reduced by the introduction of manipulators. Qualitative results such as enhanced job attractiveness and qualified personnel connected with the introduction of new technical systems are presented as well as the shortcomings regarding standardized ergonomical planning and configurations.

Author (ESA)

55 PLANETARY BIOLOGY

Includes exobiology; and extraterrestrial life.

N85-28562*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

THE COSMIC HISTORY OF THE BIOGENIC ELEMENTS AND COMPOUNDS

John A. Wood (Harvard-Smithsonian Center for Astrophysics) and Sherwood Chang 1985 87 p

(NASA-SP-476; NAS 1.21:476) Avail: NTIS MF A01; SOD HC $3.50 as 033-000-00948-8 CSCL 01C

An overview of the cosmic history of biogenic elements is presented. G.L.C.

59 MATHEMATICAL AND COMPUTER SCIENCES (GENERAL)

N85-28563*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.

COMPUTATIONAL GEOMETRY AND COMPUTER-AIDED DESIGN Extended Abstracts

Temple H. Fay, comp. (Univ. of Southern Mississippi, Hattiesburg) and John N. Shoosmith, comp. Washington Jun. 1985 117 p refs Conf. held in New Orleans, 5-8 Jun. 1985; sponsored in cooperation with Univ. of Southern Mississippi

(NASA-CP-2379; L-16003; NAS 1.55:2379) Avail: NTIS HC A06/MF A01 CSCL 12A

Extended abstracts of papers addressing the analysis, representation, and synthesis of shape information are presented. Curves and shape control, grid generation and contouring, solid modelling, surfaces, and curve intersection are specifically addressed. For individual titles, see N85-28564 through N85-28592.

N85-28564*# Brunel Univ., Uxbridge (England).

SHAPE PRESERVING SPLINE INTERPOLATION Abstract Only **c64**

John A. Gregory *In* NASA. Langley Research Center Computational Geometry and Computer-Aided Design Jun. 1985 p 1-8 refs (For primary document see N85-28563 17-59)

Avail: NTIS HC A06/MF A01 CSCL 12A

A rational spline solution to the problem of shape preserving interpolation is discussed. The rational spline is represented in terms of first derivative values at the knots and provides an alternative to the spline-under-tension. The idea of making the shape control parameters dependent on the first derivative unknowns is then explored. The monotonic or convex shape of the interpolation data can then be preserved automatically through the solution of the resulting non-linear consistency equations of the spline. M.G.

N85-28565*# Boeing Computer Services Co., Seattle, Wash.

THE CONSTRUCTION OF CURVES AND SURFACES USING NUMERICAL OPTIMIZATION TECHNIQUES Abstract Only **c64**

David R. Ferguson *In* NASA. Langley Research Center Computational Geometry and Computer-Aided Design Jun. 1985 p 9-14 refs (For primary document see N85-28563 17-59)

Avail: NTIS HC A06/MF A01 CSCL 12A

Numerical optimization techniques are playing an increasing role in curve and surface construction. Often difficult problems in curve and surface construction, especially when some aspect of shape control is involved, can be phrased as a constrained optimization problem. Four such classes of problems are explored: parametric curve fitting with non-linear shape constraints; explicit surface fitting with linear shape constraints; surface fitting to scattered data giving rise to ill-posed problems; finally, variable knot problems. In each of these problems there is a nonlinear aspect: either the shape of the curve or surface is important for manufacturing or engineering reasons or the shape affects the convergence of numerical algorithms which use the curve or surface or the placement of knots affects the accuracy of the fits. In all cases the class of functions used is that of parametric spline curves and tensor or direct product spline surfaces. The reason for choosing this class is that splines provide flexible models that are easily evaluated and stored. Furthermore, the B-spline representation of splines leads to convenient expressions for shape control over regions. M.G.

N85-28566*# Technische Univ., Brunswick (West Germany). Angewandte Geometrie und GDV.

MULTIVARIATE SPLINE ALGORITHMS FOR CAGD Abstract Only **c64**

Wolfgang Boehm *In* NASA. Langley Research Center Computational Geometry and Computer-Aided Design Jun. 1985 p 15-20 refs (For primary document see N85-28563 17-59)

Avail: NTIS HC A06/MF A01 CSCL 12A

Two special polyhedra present themselves for the definition of B-splines: a simplex S and a box or parallelepiped B, where the edges of S project into an irregular grid, while the edges of B project into the edges of a regular grid. More general splines may be found by forming linear combinations of these B-splines, where the three-dimensional coefficients are called the spline control points. Univariate splines are simplex splines, where $s = 1$, whereas splines over a regular triangular grid are box splines, where $s = 2$. Two simple facts render the development of the construction of B-splines: (1) any face of a simplex or a box is again a simplex or box but of lower dimension; and (2) any simplex or box can be easily subdivided into smaller simplices or boxes. The first fact gives a geometric approach to Mansfield-like recursion formulas that express a B-spline in B-splines of lower order, where the coefficients depend on x. By repeated recursion, the B-spline will be expressed as B-splines of order 1; i.e., piecewise constants. In the case of a simplex spline, the second fact gives a so-called insertion algorithm that constructs the new control points if an additional knot is inserted. M.G.

N85-28567*# Utah Univ., Salt Lake City. Dept. of Mathematics.

A SURVEY OF PATCH METHODS Abstract Only **c64**

R. E. Barnhill *In* NASA. Langley Research Center Computational Geometry and Computer-Aided Design Jun. 1985 p 21-26 refs (For primary document see N85-28563 17-59)

Avail: NTIS HC A06/MF A01 CSCL 12A

Patch methods are someshow a response to the fact that surface geometry is local, that is, only small parts of a surface are created at a time. The two categories of patches, transfinite patches and finite dimensional patches are examined and a discussion of trivariate patches is presented. M.G.

N85-28568*# Rensselaer Polytechnic Inst., Troy, N. Y.

WHEN IS A BERNSTEIN-BEZIER CURVE THE GRAPH OF A FUNCTION? Abstract Only **c64**

Harry W. McLaughlin *In* NASA. Langley Research Center Computational Geometry and Computer-Aided Design Jun. 1985

p 29-30 (For primary document see N85-28563 17-59)
Avail: NTIS HC A06/MF A01 CSCL 12A

The question of determining when a Bernstein-Bezier cubic curve in the plane can be represented as the graph of function in some fixed orthogonal coordinate system is considered. The notion of a curve being monotone in a given direction is introduced to aid in the analysis. M.G.

N85-28569*# Cranfield Inst. of Tech., Bedford (England).
FREE-FORM DESIGN IN SOLID MODELLING c64
M. J. Pratt *In* NASA. Langley Research Center Computational Geometry and Computer-Aided Design Jun. 1985 p 31-34 refs (For primary document see N85-28563 17-59)
Avail: NTIS HC A06/MF A01 CSCL 12A

Solid modelling is developed as a means of representing the shapes of components used in the less specialized mechanical engineering industries. Solids can now be modelled with free form surfaces. In some cases parametric geometry is used exclusively, while in others here is mixed use of parametric and implicit geometry. A method is suggested and discussed for free form solids modelling. The method has several advantages, one of which is that it avoids the use of detached surfaces, Boolean operations and surface intersection computations. It involves only minor topological changes to the model and is therefore computationally efficient. E.R.

N85-28570*# Sandia Labs., Albuquerque, N. Mex. CAD Technology Div.
BOUNDARY TO CONSTRUCTIVE SOLID GEOMETRY MAPINGS: A FOCUS ON 2-D ISSUES Abstract Only c64
Donald P. Peterson *In* NASA. Langley Research Center Computational Geometry and Computer-Aided Design Jun. 1985 p 35-36 (For primary document see N85-28563 17-59)
(Contract DE-AC04-76DP-00078)
Avail: NTIS HC A06/MF A01 CSCL 12A

The problem of converting boundary representation (B-rep) to constructive solid geometry representation (CSG-rep) (and vice versa) is discussed in two phases. The first phase entails finding a CSG-rep that defines the region bounded by a polygonal profile curve. The second phase utilizes the results of the first phase to find a CSG-rep for many non-polygonal profile curves. A mathematically concise representation of a region bounded by an n sided is presented. Namely, any polygonal region bounded by an n sided polygon may be represented by a binary tree which has at most n planar halfspaces as leaves. A structure for this representation and an algorithm for calculating is discussed. Author

N85-28571*# Allied Bendix Aerospace, Kansas City, Mo.
THE DEFINITION AND COMPUTATION OF A METRIC ON PLANE CURVES. THE MEANING OF A FACE ON A GEOMETRIC MODEL c64
James D. Emery *In* NASA. Langley Research Center Computational Geometry and Computer-Aided Design Jun. 1985 p 37-44 refs (For primary document see N85-28563 17-59)
Avail: NTIS HC A06/MF A01 CSCL 12A

Two topics in topology, the comparison of plane curves and faces on geometric models, are discussed. With regard to the first problem, a curve is defined to be a locus of points without any underlying parameterization. A metric on a class of plane curves is defined, a finite computation of this metric is given for the case of piecewise linear curves, and it is shown how to approximate curves that have bounded curvature by piecewise linear curves. In this way a bound on the distance between two curves can be computed. With regard to the second problem, the questions to be discussed are under what circumstances do geometrical faces make sense; how can they be explicity defined; and when are these geometrical faces homeomorphic to the realization of the abstract (topological) face. R.J.F.

N85-28572*# Finite Element Graphics Systems Ltd., Cambridge (England).
SOME NEGATIVE RESULTS IN N-SIDED PATCHES Abstract Only c64
Malcolmb Sabin *In* NASA. Langley Research Center Computational Geometry and Computer-Aided Design Jun. 1985 p 45 refs (For primary document see N85-28563 17-59)
Avail: NTIS HC A06/MF A01 CSCL 12A

To ease surface definition in situations of complex topology, patches with other than four sides and with guaranted continuity of at least slope with adjacent patches are needed. There are known techniques in the literature for three- and five-sided patches of reasonably economy, and known transfinite methods for many sides. Some of the conditions that a six-sided patch must satisfy and how certain simpler approaches are not effective are shown. Author

N85-28573*# Los Alamos Scientific Lab., N. Mex.
EXAMINATION OF THE CIRCLE SPLINE ROUTINE Abstract Only c64
Ronald M. Dolin and Dwight L. Jaeger *In* NASA. Langley Research Center Computational Geometry and Computer-Aided Design Jun. 1985 p 47-49 (For primary document see N85-28563 17-59)
Avail: NTIS HC A06/MF A01 CSCL 12A

The Circle Spline routine is currently being used for generating both two and three dimensional spline curves. It was developed for use in ESCHER, a mesh generating routine written to provide a computationally simple and efficient method for building meshes along curved surfaces. Circle Spline is a parametric linear blending spline. Because many computerized machining operations involve circular shapes, the Circle Spline is well suited for both the design and manufacturing processes and shows promise as an alternative to the spline methods currently supported by the Initial Graphics Specification (IGES). Author

N85-28574*# University of Southern Illinois, Carbondale. Dept. of Mathematics.
CONVEX INTERPOLATING SPLINES OF ARBITRARY DEGREE Abstract Only c64
Edward Neuman (Wroclaw Univ.) *In* NASA. Langley Research Center Computational Geometry and Computer-Aided Design Jun. 1985 p 51-54 (For primary document see N85-28563 17-59)
Avail: NTIS HC A06/MF A01 CSCL 12A

Shape preserving approximations are constructed by interpolating the data with polynomial splines of arbitrary degree. A regularity condition is formulated on the data which insures the existence of such a shape preserving spline, an algorithm is presented for its construction, and the uniform norm of the error is bound which results when the algorithm is used to produce an approximation to a given f epsilon C[a,b]. Author

N85-28575*# North Carolina State Univ., Raleigh.
A NATURAL BIAS APPROACH TO CARDINAL SPLINE CURVES Abstract Only c64
G. Yates Fletcher and David F. McAllister *In* NASA. Langley Research Center Computational Geometry and Computer-Aided Design Jun. 1985 p 55-58 refs (For primary document see N85-28563 17-59)
(Grant NAG1-103)
Avail: NTIS HC A06/MF A01 CSCL 12A

The cardinal spline approach to defining interpolatory curves is of interest in the application of computer graphics to modelling and animation problems. The formulation of this interpolation problem (C) a vector valued function V is obtained which forms a C1 map from [0,n] into the plane in such a way that V(i) and V prime (i) attain prespecified (vector) values P sub i and T sub i for the integers i=0, 1,...n. The intent is that the planar curves V(s) pass through each point P sub i in the direction corresponding to T sub i. In actual practice it is common for only the interpolation points P sub i to be user specified. Suitable tangents T sub i are then provided by some heuristic to complete the specification of (C). A convex control polygon yields a convex interpolant. Examples exist where the interpolant fails to be convex if the tangents are left unbiased. Author

N85-28576*# Purdue Univ., Lafayette, Ind. Computer Aided Design Lab.

ADAPTING SHAPE PARAMETERS FOR CUBIC BEZIER CURVES c64

David Isacoff and Michael J. Bailey *In* NASA. Langley Research Center Computational Geometry and Computer-Aided Design Jun. 1985 p 59-64 refs Sponsored by Control Data Corp. (For primary document see N85-28563 17-59)

Avail: NTIS HC A06/MF A01 CSCL 12A

Bezier curves are an established tool in Computer Aided Geometric Design. One of the drawbacks of the Bezier method is that the curves often bear little resemblance to their control polygons. As a result, it becomes increasingly difficult to obtain anything but a rough outline of the desired shape. One possible solution is tomanipulate the curve itself instead of the control polygon. The standard cubic Bezier curve form has introduced into it two shape parameters, gamma 1 and 2. These parameters give the user the ability to manipulate the curve while the control polygon retains its original form, thereby providing a more intuitive feel for the necessary changes to the curve in order to achieve the desired shape. Author

N85-28577*# Utah Univ., Salt Lake City. Dept. of Mathematics.

TRIANGULAR BERSTEIN-BEZIER PATCHES, A SURVEY AND NEW RESULTS Abstract Only c64

Gerald Farin *In* NASA. Langley Research Center Computational Geometry and Computer-Aided Design Jun. 1985 p 65-66 refs (For primary document see N85-28563 17-59)

Avail: NTIS HC A06/MF A01 CSCL 12A

Triangular Bernstein-Bezier patches are an alternative to the standard rectangular ones. They are maps of triangular domains into R cubed, where the patches are described by control nets similar to the rectangular case. One difference in the definition of surface normals at the patch corners: rectangular patches have inherent problems with so-called degenerate corners, i.e., edges collapsing into one point. Triangular patches do not have these problems. Since triangular shapes arise rather frequently in the design of complicated surfaces (e.g., interior car body panels), it seems that for such surfaces triangular patches are a promising addition to the usually employed rectangular patches. Another major application is the formulation of interpolants to solve the scattered data problem: here Bernstein-Bezier patches provide a very powerful tool; they can be used to discover new schemes as well as to discover new properties of existing methods. Author

N85-28578*# California Univ., Davis. Dept. of Electrical and Computer Engineering.

A UNIFORM SUBDIVISION METHOD FOR TRIANGULAR BEZIER PATCHES c64

Kenneth I. Joy *In* NASA. Langley Research Center Computational Geometry and Computer-Aided Design Jun. 1985 p 67-70 refs (For primary document see N85-28563 17-59)

Avail: NTIS HC A06/MF A01 CSCL 12A

A subdivision method for Bezier triangles is presented that parallels the development of Lane-Riesenfeld for Bezier Curves. The method is developed from the mathematical description of the patch, and the resulting algorithm does not require evaluation of the blending functions. This method subdivides the triangle uniformly so that the lengths of the sides of the subtriangles are uniformly reduced. This method is a member of the class of methods first presented by Goldman, which contain subdivision methods that arise from degenerate subdivision of Bezier tetrahedra. It is shown that a certain method is a natural extension of the Lane-Riesenfeld results for Bezier curves. Author

N85-28579*# California Univ., Berkeley. Computer Graphics Lab.

AN INTUITIVE APPROACH TO GEOMETRIC CONTINUITY FOR PARAMETRIC CURVES AND SURFACES (EXTENDED ABSTRACT) Abstract Only c64

Tony D. DeRose and Brian A. Barsky *In* NASA. Langley Research Center Computational Geometry and Computer-Aided Design Jun. 1985 p 71-76 refs Sponsored in cooperation with the State of California and Shell Doctoral Fellowship (For primary document see N85-28563 17-59)

(Contract N00039-82-C-0235; Grant NSF ECS-82-04381)

Avail: NTIS HC A06/MF A01 CSCL 12A

The notion of geometric continuity is extended to an arbitrary order for curves and surfaces, and an intuitive development of constraints equations is presented that are necessary for it. The constraints result from a direct application of the univariate chain rule for curves, and the bivariate chain rule for surfaces. The constraints provide for the introduction of quantities known as shape parameters. The approach taken is important for several reasons: First, it generalizes geometric continuity to arbitrary order for both curves and surfaces. Second, it shows the fundamental connection between geometric continuity of curves and geometric continuity of surfaces. Third, due to the chain rule derivation, constraints of any order can be determined more easily than derivations based exclusively on geometric measures. Author

N85-28580*# Control Data Corp., Minneapolis, Minn.

URN MODELS AND BETA-SPLINES c64

R. N. Goldman *In* NASA. Langley Research Center Computational Geometry and Computer-Aided Design Jun. 1985 p 77-82 refs (For primary document see N85-28563 17-59)

Avail: NTIS HC A06/MF A01 CSCL 12A

Some insight into the properties of beta-splines is gained by applying the techniques of urn models. Urn models are used to construct beta-spline basis functions and to derive the basic properties of these blending functions and the corresponding beta-spline curves. Only the simple notion of linear geometric continuity and with the most elementary beta parameter are outlined. Non-linear geometric continuity leads to additional beta parameters and to more complicated basis functions. Whether urn models can give us any insight into these higher order concepts still remains to be investigated. Author

N85-28581*# Mississippi State Univ., Mississippi State.

PARAMETERIZATION IN GRID GENERATION c64

C. Wayne Mastin *In* NASA. Langley Research Center Computational Geometry and Computer-Aided Design Jun. 1985 p 83-86 ref (For primary document see N85-28563 17-59)

(Grant NsG-1577)

Avail: NTIS HC A06/MF A01 CSCL 12A

The distribution of grid points for calculating the solution of partial differential equations is chosen so as to include consideration of truncation error, stability, and the resolution of the solution near boundary layers and shocks. It is important to specify the distribution of points along a grid line. The problem of distributing points along a curve is considered. It is assumed that the curve is defined parametrically. The objective is to select a set of parameter values so that the corresponding points on the curves are properly distributed. The distribution is based on some intrinsic property of the curve such as arc length or curvature. Author

N85-28582*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

CONTOURING TRIVARIATE DATA c64

Sarah E. Stead and George T. Makatura (Informatics General Corp., Palo Alto, Calif.) *In* NASA. Langley Research Center Computational Geometry and Computer-Aided Design Jun. 1985 p 87-90 refs (For primary document see N85-28563 17-59)

Avail: NTIS HC A06/MF A01 CSCL 12A

In many applications, the data consist of discrete 3-D points at which one or more parameters are given. To display contours, the data are represented by a continuous function which is evaluated at any point as needed for contouring. Contouring results are presented which are applicable both to artitrarily spaced data and to data which lie on a topologically rectangular three dimensional grid. the contours are assumed to be described by 3-D display lists for viewing on a dynamic color graphics device; that is, they will not simply be projected into 2-D and viewed as a static image on a frame buffer. Dynamic viewing of color contours may be essential to the proper interpretation of results. The gridded data lie on a topologically rectangular grid although two or more nodes may be the same point. Parametric tensor product methods may be used to fit the gridded data and to generate the contours.

Rectangular elements are convenient but not necessary. For example, there are other methods which are effective for contouring over tetrahedral elements. Author

N85-28583*# Mississippi State Univ., Mississippi State. Dept. of Aerospace Engineering.
GENERATION OF SURFACE COORDINATES BY ELLIPTIC PARTIAL DIFFERENTIAL EQUATIONS c64
Z. U. A. Warsi *In* NASA. Langley Research Center Computational Geometry and Computer-Aided Design Jun. 1985 p 91-94 refs Sponsored by AFOSR (For primary document see N85-28563 17-59)
Avail: NTIS HC A06/MF A01 CSCL 12A

The problem of generating spatial coordinates by numerical methods through carefully selected mathematical models is of current interest both in mechanics and physics. The problem of generation of a desired system of coordinates in a given surface was considered, which essentially is an effort directed to the problem of grid generation in a two-dimensional non-Euclidean space. The mathematical model selected for this purpose is based on the formulae of Gauss for a surface. The proposed equations can be used to generate a new coordinate system from the data of an already given coordinate system in a surface. If the coefficients of the first and second fundamental forms have been given, then the proposed equations can be used to generate a surface satisfying the given data (surface fitting). The proposed equations can also be used to generate surfaces in the space between two arbitrary given surfaces, thus providing 3D grids in an Euclidean space. R.J.F.

N85-28584*# Mississippi State Univ., Mississippi State. Dept. of Aerospace Engineering.
A SURVEY OF COMPOSITE GRID GENERATION FOR GENERAL THREE-DIMENSIONAL SECTIONS c64
Joe F. Thompson *In* NASA. Langley Research Center Computational Geometry and Computer-Aided Design Jun. 1985 p 95-97 refs (For primary document see N85-28563 17-59)
Avail: NTIS HC A06/MF A01 CSCL 12A

The generation and use of composite grids for general three-dimensional physical boundary configurations is discussed, and the availability of several codes or procedures is noted. With the composite framework, the physical region is segmented into sub-regions, each bounded by six curved sides, and a grid is generated in each sub-region. These grids may be joined at the interfaces between the sub-regions with various degrees of continuity. This structure allows codes to be constructed to operate on rectangular blocks in computational space, so that existing solution procedures can be readily incorporated in the construction of codes for general configurations. Numerical grid generation is an integral part of the numerical solution of partial differential equations and is one of the pacing items in the development of codes for general configurations. The numerically generated grid frees the computational simulation from restriction to certain boundary shapes and allows general codes to be written in which the boundary shape is specified simply by input. The numerically generated grid allows all computation to be done on a fixed square grid in the computational space, which is always rectangular by construction. R.J.F.

N85-28585*# Virginia Univ., Charlottesville. Dept. of Computer Science.
A UNIFIED REPRESENTATION SCHEME FOR SOLID GEOMETRIC OBJECTS USING B-SPLINES (EXTENDED ABSTRACT) Abstract Only c64
Dennis Bahler *In* NASA. Langley Research Center Computational Geometry and Computer-Aided Design Jun. 1985 p 99-104 refs (For primary document see N85-28563 17-59)
(Grants NAG5-28209; NSF MCS-83-02654)
Avail: NTIS HC A06/MF A01 CSCL 12A

A geometric representation scheme called the B-spline cylinder, which consists of interpolation between pairs of uniform periodic cubic B-spline curves is discussed. This approach carries a number of interesting implications. For one, a single relatively simple database schema can be used to represent a reasonably large class of objects, since the spline representation is flexible enough to allow a large domain of representable objects at very little cost in data complexity. The model is thus very storage-efficient. A second feature of such a system is that it reduces to one the number of routines which the system must support to perform a given operation on objects. Third, the scheme enables easy conversion to and from other representations. The formal definition of the cylinder entity is given. In the geometric properties of the entity are explored and several operations on such objects are defined. Some general purpose criteria for evaluating any geometric representation scheme are introduced and the B-spline cylinder scheme according to these criteria is evaluated. R.J.F.

N85-28586*# Ford Motor Co., Dearborn, Mich. Computer-Aided Engineering Dept.
IMPROVING THE EFFECTIVENESS OF INTEGRAL PROPERTY CALCULATION IN A CSG SOLID MODELING SYSTEM BY EXPLOITING PREDICTABILITY c64
Alan L. Clark *In* NASA. Langley Research Center Computational Geometry and Computer-Aided Design Jun. 1985 p 105-108 (For primary document see N85-28563 17-59)
Avail: NTIS HC A06/MF A01 CSCL 12A

Integral property calculation is an important application for solid modeling systems. Algorithms for computing integral properties for various solid representation schemes are fairly well known. It is important to deigners and users of solid modeling systems to understand the behavior of such algorithms. Specifically the trade-off between execution time and accuracy is critical to effective use of integral property calculation. The average behavior of two algorithms for Constructive Solid Geometry (CSG) representations is investigated. Experimental results from the PADL-2 solid modeling system show that coarse decompositions can be used to predict execution time and error estimates for finer decompositions. Exploiting this predictability allow effective use of the algorithms in a solid modeling system. R.J.F.

N85-28587*# New Orleans Univ., La.
SPLINE CURVES, WIRE FRAMES AND B-VALUE c64
Leigh Smith and Frederick Munchmeyer *In* NASA. Langley Research Center Computational Geometry and Computer-Aided Design Jun. 1985 p 109-112 refs (For primary document see N85-28563 17-59)
Avail: NTIS HC A06/MF A01 CSCL 12A

The methods that were developed for wire-frame design are described. The principal tools for control of a curve during interactive design are mathematical ducks. The simplest of these devices is an analog of the draftsman's lead weight that he uses to control a mechanical spline also create Ducks for controlling differential and integral properties of curves were created. Other methods presented include: constructing the end of a Bezier polygon to gain quick and reasonably confident control of the end tangent vector, end curvature and end torsion; keeping the magnitude of unwanted curvature oscillations within tolerance; constructing the railroad curves that appear in many engineering design problems; and controlling the frame to minimize errors at mesh points and to optimize the shapes of the curve elements. R.J.F.

N85-28588*# Dundee Univ. (Scotland). Dept. of Anatomy.
NUMERICAL ESTIMATION OF THE CURVATURE OF BIOLOGICAL SURFACES Abstract Only c64
P. H. Todd *In* NASA. Langley Research Center Computational Geometry and Computer-Aided Design Jun. 1985 p 113-115 (For primary document see N85-28563 17-59)
Avail: NTIS HC A06/MF A01 CSCL 12A

Many biological systems may profitably be studied as surface phenomena. A model consisting of isotropic growth of a curved surface from a flat sheet is assumed. With such a model, the Gaussian curvature of the final surface determines whether growth rate of the surface is subharmonic or superharmonic. These properties correspond to notions of convexity and concavity, and thus to local excess growth and local deficiency of growth. In

biological models where the major factors controlling surface growth are intrinsic to the surface, researchers thus gained from geometrical study information on the differential growth undergone by the surface. These ideas were applied to an analysis of the folding of the cerebral cortex, a geometrically rather complex surface growth. A numerical surface curvature technique based on an approximation to the Dupin indicatrix of the surface was developed. A metric for comparing curvature estimates is introduced, and considerable numerical testing indicated the reliability of this technique. R.J.F.

N85-28589*# CADLINC, Inc., Troy, Mich.
A NEW TECHNIQUE FOR SYSTEM-TO-SYSTEM TRANSFER OF SURFACE DATA Abstract Only c64
Michael W. Sterling, Michael E. Lucius, and William J. Gordon (Drexel Univ., Philadelphia, Pa.) *In* NASA. Langley Research Center Computational Geometry and Computer-Aided Design Jun. 1985 p 117-118 (For primary document see N85-28563 17-59)
Avail: NTIS HC A06/MF A01 CSCL 12A

The purpose is to describe a recently developed technique aimed at providing a universal interface between surface types. In brief, a software package was developed which functions a common denominator of CAD/CAM surface types. This software enable one to convert from any given surface representation to any other target representation. The tiles maintain the same slope continuity as the target surface gram, bicubic patches are used since they allow one to match point, slope, and twist vectors to the target surface. Thus, slopes can be continuous or discontinuous as they are on the target surface. The patches can be of lower order if desired. For example, if only point information is available, the patches produced will be bilinear; however, the number of patches required is likely to increase correspondingly. The patches can be of higher order although many systems will not accept patches of more than order four. The final result of the program is a rectangular grid of bicubic patches. The patches fit the target surface exactly at their corners. Also, the patch corners have the same tangent and twist vectors. Adjacent patches will have slope continuity, unless a discontinuity was indicated by the target surface. R.J.F.

N85-28590*# National Research Inst. for Mathematical Sciences, Pretoria (South Africa).
CURVED FINITE ELEMENTS AND CURVE APPROXIMATION c64
M. Louisa Baart *In* NASA. Langley Research Center Computational Geometry and Computer-Aided Design Jun. 1985 p 119-112 refs (For primary document see N85-28563 17-59)
Avail: NTIS HC A06/MF A01 CSCL 12A

The approximation of parameterized curves by segments of parabolas that pass through the endpoints of each curve segment arises naturally in all quadratic isoparametric transformations. While not as popular as cubics in curve design problems, the use of parabolas allows the introduction of a geometric measure of the discrepancy between given and approximating curves. The free parameters of the parabola may be used to optimize the fit, and constraints that prevent overspill and curve degeneracy are introduced. This leads to a constrained optimization problem in two varibles that can be solved quickly and reliably by a simple method that takes advantage of the special structure of the problem. For applications in the field of computer-aided design, the given curves are often cubic polynomials, and the coefficient may be calculated in closed form in terms of polynomial coefficients by using a symbolic machine language so that families of curves can be approximated with no further integration. For general curves, numerical quadrature may be used, as in the implementation where the Romberg quadrature is applied. The coefficient functions C sub 1 (gamma) and C sub 2 (gamma) are expanded as polynomials in gamma, so that for given A(s) and B(s) the integrations need only be done once. The method was used to find optimal constrained parabolic approximation to a wide variety of given curves. R.J.F.

N85-28591*# Structural Dynamics Research Corp., Milford, Ohio.
COMPARISON OF TWO ALGEBRAIC METHODS FOR CURVE/CURVE INTERSECTION c64
Yves deMontaudouin and Wayne Tiller *In* NASA. Langley Research Center Computational Geometry and Computer-Aided Design Jun. 1985 p 123-125 refs (For primary document see N85-28563 17-59)
Avail: NTIS HC A06/MF A01 CSCL 12A

Most geometric modeling systems use either polynomial or rational functions to represent geometry. In such systems most computational problems can be formulated as systems of polynomials in one or more variables. Classical elimination theory can be used to solve such systems. Here Cayley's method of elimination is summarized and it is shown how it can best be used to solve the curve/curve intersection problem. Cayley's method was found to be a more straightforward approach. Furthermore, it is computationally simpler, since the elements of the Cayley matrix are one variable instead of two variable polynomials. Researchers implemented and tested both methods and found Cayley's to be more efficient. Six pairs of curves, representing mixtures of lines, circles, and cubic arcs were used. Several examples had multiple intersection points. For all six cases Cayley's required less CPU time than the other method. The average time ratio of method 1 to method 2 was 3.13:1, the least difference was 2.33:1, and the most dramatic was 6.25:1. Both of the above methods can be extended to solve the surface/surface intersection problem. R.J.F.

N85-28592*# Brigham Young Univ., Provo, Utah.
A COMPARISON OF THREE CURVE INTERSECTION ALGORITHMS Abstract Only c64
Thomas W. Sederberg and Scott R. Parry *In* NAA. Langley Research Center Computational Geometry and Computer-Aided Design Jun. 1985 p 127-128 refs (For primary document see N85-28563 17-59)
Avail: NTIS HC A06/MF A01 CSCL 12A

An empirical comparison is made between three algorithms for computing the points of intersection of two planar Bezier curves. The algorithms compared are: the well known Bezier subdivision algorithm, which is discussed in Lane 80; a subdivision algorithm based on interval analysis due to Koparkar and Mudur; and an algorithm due to Sederberg, Anderson and Goldman which reduces the problem to one of finding the roots of a univariate polynomial. The details of these three algorithms are presented in their respective references. R.J.F.

60 COMPUTER OPERATIONS AND HARDWARE

Includes computer graphics and data processing.
For components see *33 Electronics and Electrical Engineering.*

N85-28593*# Mitre Corp., McLean, Va. Metrek Div.
NASA GUIDELINES FOR ASSURING THE ADEQUACY AND APPROPRIATENESS OF SECURITY SAFEGUARDS IN SENSITIVE APPLICATIONS
F. G. Tompkins Sep. 1984 127 p refs
(Contract NASw-3425)
(NASA-CR-175489; NAS 1.26:175489; MTR-84W-00179) Avail: NTIS HC A07/MF A01 CSCL 09B

The Office of Management and Budget (OMB) Circular A-71, transmittal Memorandum No. 1, requires that each agency establish a management control process to assure that appropriate administrative, physical and technical safeguards are incorporated into all new computer applications. In addition to security specifications, the management control process should assure that the safeguards are adequate for the application. The security activities that should be integral to the system development process are examined. The software quality assurance process to assure that adequate and appropriate controls are incorporated into sensitive applications

is also examined. Security for software packages is also discussed. Author

N85-28594# Brown Univ., Providence, R. I. Center for Neural Science.
LANGUAGE DESIGN, COMPUTERS AND BRAINS
H. Kucera 29 Mar. 1985 23 p
(Contract N00014-81-K-0136)
(AD-A152819; TR-26) Avail: NTIS HC A02/MF A01 CSCL 05/7

The processing of natural languages by computers and the programming of computers to simulate some aspects of language learning offer insights into those aspects of language design which allow successful processing to take place as well as those properties of natural languages which make their computer-based analysis difficult. In essence, these factors represent the differences between the two information processors involved in all such endeavors, the biological one, the human brain, of which natural languages are an evolutionary product, and the digital computer. The properties of language which allow computer processing of language data are those of structure, specifiable by a grammar which captures systematically the redundancy in language organization and its striving towards a reasonable degree of efficiency. The difficulties encountered in language processing by computers center around ambiguity, which can be either structural or semantic. The theory of markedness is described which posits a systematic use of semantic ambiguity for the sake of efficient communication. Finally, a project conducted at Brown University is described, in which a computer program simulating a child learner acquires an interesting subset of English grammar from a parent program which knows the language. GRA

N85-28595# Rochester Univ., N. Y. Dept. of Computer Science.
OPTICAL PHENOMENA IN COMPUTER VISION
S. A. Shafer Mar. 1984 39 p
(Contract N00014-82-K-0193)
(AD-A152970; TR-135) Avail: NTIS HC A03/MF A01 CSCL 09/2

Computer vision programs are based on some kind of model of the optical world, in addition to whatever significance they may have in terms of human vision, algorithms, architectures, etc. There is a school of research that addresses this aspect of computer vision directly, by developing mathematical models of the optics and geometry of image formation and applying these models in image understanding algorithms. In this paper, we examine the optical phenomena that have been analyzed in computer vision and suggest several topics for future research. The three topics that have received the most attention are shading (and glossiness), color, and shadows. Shape-from-shading research, while producing many interesting algorithms and research results, has primarily been based on very simplified models of glossiness. Since realistic gloss models exist within the optics community, we can expect improved computer vision algorithms in the future. Color work in the past has similarly concentrated on developing sophisticated algorithms for exploiting very simple color models, but a more realistic analysis technique has recently been proposed. Shadows have been used by a number of people for simple analysis such as locating buildings in aerial photographs, and a more complex theory already exists that relates surface orientations to shapes of shadows in the image. GRA

N85-28596# Rome Air Development Center, Griffiss AFB, N.Y.
THE TOUCH PANEL SYSTEM: DESIGN AND DEVELOPMENT
M. J. Valentine Dec. 1984 20 p
(AF Proj. 4594)
(AD-A153014; RADC-TR-84-258) Avail: NTIS HC A02/MF A01 CSCL 09/2

The computer keyboard can sometimes be difficult to use, especially with the number of different types that are manufactured. The touch panel concept eliminates the need for a keyboard to use a computer. The touch-panel works on a light sensor idea whereby breaking a beam of light causes an entry to be made into the computer. It is much easier than having to type the entries on a keyboard. The programmable switch array detection and selection system, commonly referred to as a touch panel, is an alternate way of entering data and instructions into a computer. The operator communicates with the host computer by breaking beams of light, which causes a data entry to be made. The programmable switch array was designed and developed for the Data Handling/Recording System (DH/RS) as an auxillary input device for near real time interpretation of imagery. This report is a summary of the design and development of the touch-panel system during the summer of 1984. Included in this report are the system interface design, physical characteristics and electrical circuitry. GRA

N85-28597# Rome Air Development Center, Griffiss AFB, N.Y.
RANDOM ACCESS MEMORY TECHNOLOGIES Report, for Feb. - Jul. 1984
K. W. Devaney Feb. 1985 45 p
(AF Proj. 4594)
(AD-A153089; RADC-TR-85-29) Avail: NTIS HC A03/MF A01 CSCL 09/2

This paper is the result of an inhouse study of random access memory technologies. Silicon, of course, has a firm grip on the computer industry, and the different silicon processes are discussed. However, many alternative technologies are under development. Gallium arsenide and Josephson junctions have been pursued in hopes of higher speeds and lower power consumption. Silicon on sapphire and silicon on insulator have been developed to enhance silicon's performance and eliminate such problems as latch up. Finally, the need for data retention when power is lost has spawned the existence of non-volatile memories, not only in silicon, but also in magnetic memories. Each technology's strong points and drawbacks are presented, as well as the hurdles to be overcome for further development. Emphasis is given to requirements for military applications, such as a wide temperature and radiation hardness. In this light, it is fitting that the Department of Defense's VHSIC program and its Phase 1 memories are also described in this paper. GRA

N85-28598# Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.
A COMPARISON OF NUMERIC DATA ENTRY WITH TOUCH-SENSITIVE AND CONVENTIONAL NUMERIC KEYPADS
D. G. Leupp, S. Kelly, and D. E. Bridges Feb. 1985 21 p
(AF Proj. 7184)
(AD-A153276; AFAMRL-TR-85-007) Avail: NTIS HC A02/MF A01 CSCL 05/8

This report describes two experiments designed to establish data entry characteristics of touch-sensitive numeric keypads on a CRT versus conventional telephone keypads. In both experiments, data entry consisted of entering a series of four digit numbers (displayed in sequence on a CRT) on a specified numeric keypad. In experiment 1 two touch-sensitive keypads with telephone keypad dimensions were compared to conventional telephone keypads. One of the touch-sensitive configurations included audible feedback; one conventional keypad was mounted on a sloped box on the desk, the other was mounted on the CRT. In experiment 2 four different touch-sensitive keypad configurations were tested. Results indicate that the conventional keypads were superior in both speed and accuracy to all touch-sensitive configurations tested. Accuracy of data entry with touch-sensitive keypads was significantly improved with modified keypads used in experiment 2. In particular, it was concluded that sensitive areas should extend beyond visible keys, to include all of the area between keys. GRA

N85-28599# Department of the Air Force, Washington, D.C.
GENERATION AND DISPLAY APPARATUS Patent Application
L. C. DeWitt, inventor (to Air Force) Filed 31 Jan. 1985 22 p
(AD-D011639; US-Patent-Appl-SN-696679) Avail: NTIS HC A02/MF A01 CSCL 09/2

The present invention utilizes one hundred and twenty-eight unique coordinate sets to model or represent features such as moving models, projectiles, and universal features. These placeable

features are combined by a coordinate set processor unit with fixed environmental features to provide a realistic visual display. Computer image generator systems have traditionally been severely limited in terms of the number of coordinate sets which could be processed. This invention overcomes prior limitations by reorganizing the necessary calculations such that an unreasonable penalty on throughput and/or hardware sizing is not leveled. Instead of transforming all coordinate sets into each display channel (this would require 128 coordinate sets X 10 channels = 1280 transformation matrices to be computed by a processor unit), all coordinate sets are first transformed in the present invention into environment space and then into specific display channels. GRA

N85-28600# Pacific Northwest Lab., Richland, Wash.
LOOKING AT MORE THAN THREE DIMENSIONS
W. L. Nicholson and D. B. Carr Apr. 1984 10 p refs Presented at Interface Computer Sci. and Statist. Meeting, Atlanta, 14 Mar. 1984
(Contract DE-AC06-76RL-01830)
(DE85-007764; PNL-SA-11886; CONF-8403176-1) Avail: NTIS HC A02/MF A01

Statistical graphics for data in more than three dimensions is not based on direct spatial representation. Three approaches have been tried with varying degrees of success. First is simultaneous presentation of two or three dimensional marginals with a cross reference scheme to identify common points. Second is protection into two or three dimensions and variations on this theme. Third is a single view with higher dimensions indicated by characteristics of the plotting symbol. The first two approaches admit visualization of simple conditional relationships, but putting together pieces to understand complex relationships requires substantial intellectual effort. The third is a compromise which presents some visualization of higher dimensional relationships. The third mode of display is emphasized making use of motion, color, and geometrical characteristics of the plotting symbol as higher dimensional cues. DOE

N85-28601# California Univ., Livermore. Lawrence Livermore Lab.
TRACKING ALGORITHM PERFORMANCE ANALYSIS PROGRAM (TRAPP)
S. G. Azevedo Jan. 1985 40 p refs
(Contract W-7405-eng-48)
(DE85-007304; UCID-20305) Avail: NTIS HC A03/MF A01

Target-tracking is an estimation problem for which many different computer algorithms may be designed. The choice of which algorithm best suits a particular problem is a tradeoff of tracking performance versus computational cost (memory size and speed, CPU speed, numerical accuracy required, etc.). A software program for analyzing the performance of tracking algorithms relative to one another and to an optimal solution is presented. The program, called TRAPP, accepts input in a standard format from simulation and estimation codes. It then displays the trajectories of the data in one of a variety of formats - overhead, relative, bore-sight, and earth reference frame. The simulated (true) values of target locations may be overlayed with optimal and several suboptimal estimates in any combination. The trajectories of a separate observer platform may be plotted or used as a display viewing position. Several analysis techniques are also used to compare the relative merits of algorithms. These include covariance analysis, tracking-error ellipsoids, suboptimality index, and innovations analysis. An example radar problem is given and sample estimators are compared using TRAPP outputs. DOE

N85-28602# Bendix Corp., Kansas City, Mo.
MICROPROCESSOR CONTROLLED TEMPERATURE CHASSIS Final Report
L. L. Hill Mar. 1985 9 p
(Contract DE-AC04-76DP-00613)
(DE85-008392; BDX-613-3172) Avail: NTIS HC A02/MF A01

The objective of the microprocessor controlled temperature chassis was to control temperature more reliably than the existing system and to be flexible and general purpose enough to support many temperature controlling needs. For the evaluation of the chassis, an HMC thermal chuck was controlled. It was found that this chuck could be quickly brought to temperature and maintained within one degree Celcius. The accuracy and flexibility of the system was achieved by the use of a microprocessor which is much more powerful than discrete hardware. The hardware for the chassis is configured in three blocks: control, interface, and feedback. The software was written in Intel 8085 assembly language, then downloaded into ROMs contained on the microprocessor board. DOE

N85-28603# Stanford Linear Accelerator Center, Calif.
COMPUTING ENVIRONMENTS FOR DATA ANALYSIS. PART 1: INTRODUCTION
John Alan McDonald and Jan Pedersen Feb. 1985 9 p refs Presented at the 17th Symp. on the Interface of Computer Sci. and Statistics, Lexington, Ky., 17-19 Mar. 1985
(Contracts DE-AC03-76SF-00515; N00014-83-K-0472; N00014-83-G-0121; DAAG29-82-K-0056)
(DE85-007919; SU-SLAC-PUB-3577-Pt-1; SU-STAN-LCS-9-Pt-1; CONF-8503116-1-Pt-1) Avail: NTIS HC A02/MF A01

Aspects of modern computing environments that are relevant to statistical data analysis are discussed. It is argued that a network of graphics workstations is far superior to conventional batch or time-sharing computers as an environment for interactive data analysis. A general introduction and motivation for more detailed considerations of hardware and software in subsequent parts are given. Author

N85-28604# Stanford Linear Accelerator Center, Calif. Dept. of Statistics.
COMPUTING ENVIRONMENTS FOR DATA ANALYSIS. PART 2: HARDWARE
John Alan McDonald and Jan Pedersen Feb. 1985 9 p refs Presented at the 17th Symp. on the Interface of Computer Sci. and Statistics, Lexington, Ky., 17-19 Mar. 1985 Sponsored in cooperation with NSF
(Contracts DE-AC03-76SF-00515; N00014-83-K-0472; N00014-83-G-0121; DAAG29-82-K-0056)
(DE85-008320; SU-SLAC-PUB-3578-Pt-2; SU-STAN-LCS-10-Pt-2; CONF-8503116-1-Pt-2) Avail: NTIS HC A02/MF A01

Aspects of modern computing environments that are relevant to statistical data analysis are discussed. It is argued that a network of graphics workstations is far superior to conventional batch or time-sharing computers as an environment for interactive data analysis. The hardware of graphics workstations is discussed in detail. DOE

N85-28605# Center for Mathematics and Computer Science, Amsterdam (Netherlands). Dept. of Computer Science.
A SECURE HIGH-SPEED TRANSACTION PROTOCOL
Sape J. Mullender Oct. 1984 12 p refs Presented at EUUG Conf. 1984, Cambridge, England
(CWI-CS-R8417; B8478821) Avail: NTIS HC A02/MF A01

A high speed transaction-oriented transport protocol for the Amoeba distributed operating system with an addressing mechanism that is more general, and provides a protection mechanism was developed. The basic mechanism for communication between processes is the transaction: a client process sends a request to a server process, which carries out the request and returns a reply. Protection is provided by using ports, chosen from a sparse address space, for addressing services. These ports serve as a capability for communication with the service. Through its simplicity, the transaction protocol achieves much higher transmission rates than other protocols executing on similar hardware (300 Kbytes/sec process-to-process). Author (ESA)

N85-28606# Center for Mathematics and Computer Science, Amsterdam (Netherlands). Dept. of Computer Science.
COUNTING IS EASY
Joel Seiferas (Rochester Univ.) and Paul M. B. Vitanyi Dec. 1984 11 p refs Preliminary version
(CWI-CS-R8423; B8561782) Avail: NTIS HC A02/MF A01

The result that many independent counts with simultaneous zero-check can be maintained in real time on an oblivious single-head tape unit using the information-theoretical storage minimum is presented. Extensions of the result are discussed. Author (ESA)

N85-28607# Raith (Hermann) K.G., Dortmund (West Germany).
DEVELOPMENT OF A MULTIPROCESSOR SYSTEM, USING THE MOTORLA MICROPROCESSOR 6809, WITH THE AIM OF PROVIDING MAXIMUM FLEXIBILITY IN THE DESIGN OF INDIVIDUAL CONTROL DEVICES Final Report, Dec. 1983
Hermann Raith and Klaus-Dieter Robben Bonn Bundesministerium fuer Forschung und Technologie Dec. 1984 25 p In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-84-270; . ISSN-0340-7608) Avail: NTIS HC A02/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 5.50

A multiprocessor system allowing rapid composition of complex control devices with individual capabilities was developed by utilization of standardized sets of components. The application is a motor control unit for the five axes of a Cartesian specimen stage used in a scanning electron microscope. Fully encentric movements in tilt and rotation can be carried out by instant calculation and automatic execution of all conections necessary to fulfil the requirement of encentric maneuvers. Author (ESA)

61 COMPUTER PROGRAMMING AND SOFTWARE

Includes computer programs, routines, and algorithms.

N85-28608* Computer Software Management and Information Center, Athens, Ga.
COSMIC SOFTWARE CATALOG, 1985 EDITION
1985 499 p
(NASA-CR-174070; NAS 1.26:174070) Avail: Computer Software Management and Information Center, Barrows Hall, Univ. of Georgia, Athens, Georgia 30601 $25.00 CSCL 09B

Abstracts containing descriptions of the software supplied by NASA's Computer Software Management and Information Center are given. Abstracts for 1,409 NASA sponsored computer programs are included. Topics include aeronautical engineering, spacecraft design, launch vehicles, composite materials, rocket propellants, geophysics, meteorology, computer programming, statistical analysis, plasma physics, and transportation. R.J.F.

N85-28609*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
PEER REVIEW OF A FORMAL VERIFICATION/DESIGN PROOF METHODOLOGY Summary Report
1983 56 p refs Meeting held in Atlanta, 7-8 Jul. 1983 Prepared in cooperation with Research Triangle Inst.
(NASA-CP-2377; L-15992; NAS 1.55:2377) Avail: NTIS HC A04/MF A01 CSCL 09B

The role of formal verification techniques in system validation was examined. The value and the state of the art of performance proving for fault-tolerant compuers were assessed. The investigation, development, and evaluation of performance proving tools were reviewed. The technical issues related to proof methodologies are examined. The technical issues discussed are summarized. E.A.K.

N85-28610*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
REAL-TIME MULTIPROCESSOR PROGRAMMING LANGUAGE (RTMPL) USER'S MANUAL
Dale J. Arpasi Jun. 1985 115 p refs
(NASA-TP-2422; E-1999; NAS 1.60:2422) Avail: NTIS HC A06/MF A01 CSCL 09B

A real-time multiprocessor programming language (RTMPL) has been developed to provide for high-order programming of real-time simulations on systems of distributed computers. RTMPL is a structured, engineering-oriented language. The RTMPL utility supports a variety of multiprocessor configurations and types by generating assembly language programs according to user-specified targeting information. Many programming functions are assumed by the utility (e.g., data transfer and scaling) to reduce the programming chore. This manual describes RTMPL from a user's viewpoint. Source generation, applications, utility operation, and utility output are detailed. An example simulation is generated to illustrate many RTMPL features. Author

N85-28611*# Vought Corp., Dallas, Tex.
COMPUTER PROGRAM FOR PREDICTION OF CAPTURE MANEUVER PROBABILITY FOR AN ON-OFF REACTION CONTROLLED UPPER STAGE
R. N. Knauber May 1982 99 p
(Contract NAS1-15000)
(NASA-CR-165937; NAS 1.26:165937) Avail: NTIS HC A05/MF A01 CSCL 09B

A FORTRAN coded computer program which computes the capture transient of a launch vehicle upper stage at the ignition and/or separation event is presented. It is for a single degree-of-freedom on-off reaction jet attitude control system. The Monte Carlo method is used to determine the statistical value of key parameters at the outcome of the event. Aerodynamic and booster induced disturbances, vehicle and control system characteristics, and initial conditions are treated as random variables. By appropriate selection of input data pitch, yaw and roll axes can be analyzed. Transient response of a single deterministic case can be computed. The program is currently set up on a CDC CYBER 175 computer system but is compatible with ANSI FORTRAN computer language. This routine has been used over the past fifteen (15) years for the SCOUT Launch Vehicle and has been run on RECOMP III, IBM 7090, IBM 360/370, CDC6600 and CDC CYBER 175 computers with little modification. Author

N85-28612*# Virginia Univ., Charlottesville. Dept. of Applied Mathematics.
RESEARCH IN COMPUTER SCIENCE Semiannual Report
J. M. Ortega Jun. 1985 10 p
(Grant NAG1-242)
(NASA-CR-175922; NAS 1.26:175922; UVA/528209-AM85-107) Avail: NTIS HC A02/MF A01 CSCL 09B

Synopses are given for NASA supported work in computer science at the University of Virginia. Some areas of research include: error seeding as a testing method; knowledge representation for engineering design; analysis of faults in a multi-version software experiment; implementation of a parallel programming environment; two computer graphics systems for visualization of pressure distribution and convective density particles; task decomposition for multiple robot arms; vectorized incomplete conjugate gradient; and iterative methods for solving linear equations on the Flex/32. E.R.

N85-28613# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
INTRODUCTION TO THE IEEE-488 BUS [INTRODUCAO AO BARRAMENTO IEEE-488 (GPIB)]
Mauricio Macedo deFaria Oct. 1984 41 p refs In PORTUGUESE; ENGLISH summary
(INPE-3316-NTE/227) Avail: NTIS HC A03/MF A01

A general description of the IEEE-488 Bus, also called GPIB, HP-IB or IEC Bus is presented. After a brief historical introduction and a description of its present status, the goals and technical specifications of the bus are presented. Finally, a detailed functional description of the IEEE-488 Bus is presented. G.L.C.

N85-28614# Royal Signals and Radar Establishment, Malvern (England).
AUTOMATIC DISTRIBUTION OF PROGRAMS IN MASCOT AND ADA (TRADEMARK) ENVIRONMENTS: A FEASIBILITY STUDY
G. Fickenscher Nov. 1984 50 p

(AD-A152665; RSRE-MEMO-3696; BR94681) Avail: NTIS HC A03/MF A01 CSCL 09/1

Recent years have seen a steady increase of computer systems based on distributed hardware. This is made possible by the reduction of hardware costs and increases in the power of hardware components. More sophisticated software systems are the result. To reduce the costs for software development it would be advantageous to reuse software systems in different target environments. In the case of distributed systems this means that software may be distributed differently in different environments. It would simplify matters if the software could be distributed automatically. In this paper, the feasibility of automatic distribution of Ada programs and MASCOT-like programs is investigated. The impacts of the distribution on the runtime environment and communication system are outlined. GRA

N85-28615# Naval Postgraduate School, Monterey, Calif.
IMPLEMENTATION OF A GENERAL FINITE ELEMENT CODE ON AN IBM PC COMPATIBLE MICROCOMPUTER M.S. Thesis
R. E. Ruesch Sep. 1984 281 p
(AD-A152681) Avail: NTIS HC A13/MF A01 CSCL 09/2

The practicality of using microcomputers to solve systems of equations of several hundred unknowns has been demonstrated. However, machine and software limitations of eight bit processors made the construction of useful finite element programs very difficult, and severely limited the size of problems which could be solved in a reasonable amount of time. The introduction of the sixteen bit microprocessor has completely revolutionized the microcomputer industry, and many of the limitations of the eight systems have been eliminated. The new microcomputers have made mainframe-like computing power available to everyone, at a very reasonable cost. For many reasons, however, there are few general finite element programs available for the microcomputer today. A general finite element program of moderate complexity is adapted for implementation on the IBM PC-XT and the COLUMBIA MPC microcomputers. The resulting implementation is verified, and results are compared with other finite element systems. GRA

N85-28616# Brigham Young Univ., Provo, Utah. Computer Aided Mfg Lab.
MANUFACTURING INFORMATION SYSTEM Final Report, 1 Jul. 1982 - 31 Oct. 1984
D. K. Allen, P. R. Smith, and M. J. Smart 26 Dec. 1984 258 p (Grant AF-AFOSR-0253-82)
(AD-A152715; AFOSR-85-0275TR) Avail: NTIS HC A12/MF A01 CSCL 13/8

This is the final report of a project to develop prototype miniature laboratory apparatus to be used in conducting a series of experiments and investigations relating to a Manufacturing Information System. The size and cost of manufacturing equipment has made it extremely difficult to perform a realistic modeling and simulation of the manufacturing process in university research laboratories. Likewise the size and cost factors, coupled with many uncontrolled variables of the production situation has even made it difficult to perform adequate manufacturing research in the industrial setting. The difficulty of developing Integrated Manufacturing Systems is well documented by the large amount of funding and effort being spent by industry and government. It was the purpose for research funded under this grant to continue the development of miniature prototype equipment for use in an integrated CAD/CAM Laboratory. The equipment developed under this grant and from previous work is capable of actually performing production operations (e.g., drilling, milling, turning, punching, etc.) on metallic and non-metallic workpieces. It is now expected that the prototype equipment developed or otherwise acquired under this grant will now provide the basis for extensive research on Manufacturing Information Systems, Common Database Development, CIM Application Program Development, Local Area Networking, and Knowledge-based CAD/CAM Training utilizing Interactive Videodisc Delivery Systems. GRA

N85-28617# Naval Postgraduate School, Monterey, Calif.
INVESTIGATION AND IMPLEMENTATION OF A TREE TRANSFORMATION SYSTEM FOR USER FRIENDLY PROGRAMMING M.S. Thesis
M. B. Chok Dec. 1984 137 p
(AD-A152716) Avail: NTIS HC A07/MF A01 CSCL 09/2

The programming system (TTPS) described in this thesis is based on tree transformation techniques, commonly known as abstract transformation. The objects manipulated by the user through TTPS are: the templates, the transformation rules, and the programs. The templates define the syntactic and semantic language framework which will be used to parse and unparse both the rules and the program trees. The rules define the semantic behavior of the transformation process. The program represents the source tree which describes the problem to solve, and will be interpreted by a successive application of the supplied rules until they no longer apply. TTPS provides an appropriate environment for a large class of applications (e.g., system programming, coded generation, structure transformation, simulation of syntax directed editors, and other conventional applications), and supports many programming styles such as functional programming, and user different style. GRA

N85-28618# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
A TEST METHODOLOGY FOR AN AUTOMATED AND INTERACTIVE SOFTWARE DEVELOPMENT ENVIRONMENT M.S. Thesis
K. A. Shomper Dec. 1984 364 p
(AD-A152857; AFIT/GCS/ENG/84D-26) Avail: NTIS HC A16/MF A01 CSCL 09/2

The purpose of this investigation is to examine the concept of lifecycle testing, in particular in the AFIT education/research environment. A result of this investigation is the SDW Test Methodology, an automated/interactive testing tool to aid the software engineer in lifecycle testing. Five areas of testing are identified during this investigation which are common to software development in the analysis, design and implementation phases. These areas are consistency, correctness, clearness, completeness, and traceability. By providing automated and interactive functions to test for the errors associated with these areas, the AFIT student software engineer is relieved from the hand-testing techniques which therefore have been employed. The Tests Methodology supports the latter half of the lifecycle testing by providing interfaces to the Test Methodology for an assortment of static and dynamic analysis testing tools. On a wider scale, the ideas and conclusions presented herein are applicable in all software development environments employing a structured approach to analysis, design and implementation. However, the software tests are not generally applicable to all environments and may require modifications. The SDW Test Methodology is initially hosted on a VAX VMS 11/780 and requires interfaces to the INGRES Relational Database Manager and the Data Dictionary Generation Tool. GRA

N85-28619# Maryland Univ., College Park. Dept. of Computer Science.
CLEANROOM SOFTWARE DEVELOPMENT: AN EMPIRICAL EVALUATION
Richard W. Selby, Jr., Victor R. Basili, and F. Terry Baker Feb. 1985 34 p refs
(Contract F49620-80-C-0001)
(AD-A152924; TR-1415; AFOSR-85-0292TR) Avail: NTIS HC A03/MF A01 CSCL 09/2

The Cleanroom software development approach is intended to produce highly reliable software by integrating formal methods for specification and design, complete off-line development, and statistically based testing. In an empirical study, 15 three-person teams developed versions of the same software system; 10 teams applied Cleanroom, while five applied a more traditional approach. This analysis characterize the effect of Cleanroom on the delivered product, the software development process, and the developers. The major results of this study are: (1) most developers were able to apply the techniques of Cleanroom effectively; (2) the Cleanroom teams' products met system requirements more

completely and had a higher percentage of successful test cases; (3) the source code developed using Cleanroom had more comments and less dense complexity; (4) the use of Cleanroom successfully modified aspects of development style; and (5) most Cleanroom developers indicated they would use the approach again. GRA

N85-28620# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
AFIT GKS: A GKS IMPLEMENTATION IN THE Ada PROGRAMMING LANGUAGE M.S. Thesis
R. S. Ruegg Dec. 1984 181 p
(AD-A152954; AFIT/GCS/MATH/84D-5) Avail: NTIS HC A09/MF A01 CSCL 09/2

This theses project written in Ada, involved designing and implementing AFIT GKS which is a subset of the Graphical Kernel System (GKS). This project implemented AFIT-GKS on a ROLM Data General MV/8000-II validated Ada compiler, using a proposed Binding of GKS to Ada developed by the Harris Corporation. After introducing Ada and CKS to the reader, this project considers several alternative ways of designing AFIT-GKS. Selecting what was considered the best design alternative, this project implements AFIT-GKS. It concludes with a discussion of how well Ada, the proposed GKS binding to Ada, and GKS, worked in AFIT-GKS. This thesis found minor problems with the validated ROLM Ada Compiler, the proposed GKS binding to Ada, the GKS, but overall they were each excellent products. By using AFIT-GKS as proof, this project concludes that Ada can support large programs, and Ada can support computer graphics. GRA

N85-28621# Anamet Labs., Inc., San Carlos, Calif. Applied Mechanics Div.
SAMPLE PROBLEMS FOR STAGSC-1 Interim Report, 1 Jun. - 31 Aug. 1984
P. J. Woytowitz 28 Feb. 1985 112 p
(Contract F33615-81-C-3201)
(AD-A153142; ANAMET-884.1A; AFWAL-TR-84-3088) Avail: NTIS HC A06/MF A01 CSCL 09/2

Sample problems and clarification for the STAGSC-1 computer program are presented. The report is directed toward the beginning user of STAGSC-1, and possibly the beginner in structural and/or finite element analysis. This report was prepared as an introduction to using the STAGSC-1 computer program. It is not an attempt to rewrite the current STAGSC-1 User's Manual; however, as with any manual, there are certain aspects which sometimes are not easy to understand. This report is especially addressed to the user that might not be as experienced as the STAGSC-1 manual presumes. Clarification of selected input data cards which this reviewer found somewhat confusing are covered in Section 1.2. Section 1.3 of this report discusses selected output messages, nomenclature, and options which will aid in understanding the STAGSC-1 output. Section 2.0, which comprises the bulk of this report, is an assembly of various sample runs. The input data for the sample problems are included in the main text of this report. GRA

N85-28622# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
A MODERN CONTROL THEORY ENHANCEMENT TO AN INTERACTIVE CONTROL ENGINEERING COMPUTER ANALYSIS PACKAGE (ICECAP) M.S. Thesis
C. Narathong Dec. 1984 147 p
(AD-A153249; AFIT/GE/ENG/84D-49) Avail: NTIS HC A07/MF A01 CSCL 09/2

This thesis reports on a continued development of an Interactive Control Engineering Computer Analysis Package (ICECAP). This package applies to discrete and continuous systems. The effort developed and implemented functional requirements involved in modern control theory. This includes implementing matrix operations, a continuous time steady state Riccati solver, polynomial operations, a C(SI - A) B function, and a state variable feedback design function. Major emphasis is placed on the development of the Riccati solver. The approach employed is the eigen number approach. It provides all solutions which is not the case for other methods contained in the current literature. Additionally, a user friendly interface is also developed which permits interactive communication, user assistance and error analysis. Furthermore, the use of keyword/command word interactive technique is also employed. Lastly, and more importantly, the implementation of a state variable feedback design function allows the user to easily apply a pole placement state variable feedback design technique. GRA

N85-28623# Stanford Univ., Calif. Dept. of Computer Science.
EXPRESSIVENESS AND LANGUAGE CHOICE
J. MacKinlay and M. R. Genesereth Jan. 1985 19 p
(Contract N00014-81-K-0004)
(AD-A153280; SU-Stan-CS-85-1037; HPP-84-4) Avail: NTIS HC A02/MF A01 CSCL 09/2

Specialized languages are often more appropriate than general languages for expressing certain information. However, specialized languages must be chosen carefully because they do not allow sets of facts to be stated. This paper considers the problems associated with choosing among specialized languages. Methods are presented for determining that a set of facts is expressible in a language, for identifying when additional facts are stated accidentally, and for choosing among languages that can express a set of facts. This research is being used to build a system that automatically chooses an appropriate graphical language to present a given set of facts. GRA

N85-28624# Battelle Columbus Labs., Ohio.
STUDY OF RASTER METAFILE FORMATS Technical Report, May 1984 - Jan. 1985
M. R. Taylor and P. N. French Jan. 1985 211 p Prepared in cooperation with Resources Plannng Associates, Inc., Ithaca, NY
(Contract DAAG29-81-D-0100)
(AD-A153322; ETL-0363) Avail: NTIS HC A10/MF A01 CSCL 09/2

This report examines raster compatible, metafile systems in view of the needs of the Defense Mapping Agency Hydrographic-Topographic Center and the U.S. Army Engineer Topographic Laboratories. Background material is presented regarding the role of a graphic metafile standard in ETL/DMAHTC's cartographic applications. The issues relevant to the design of a raster compatible metafile system are examined. A recommendation is made to ETL/DMAHTC for adoption of the American National Standards Institute - Virtual Device Metafile proposed national standard. GRA

N85-28625# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
THE ADDITION OF ADVANCED SCENE RENDERING TECHNIQUES TO A GENERAL PURPOSE GRAPHICS PACKAGE M.S. Thesis
L. R. C. Suzuki Dec. 1984 221 p Original contains color illustrations
(AD-A153323; AFIT/GCS/MATH/84D-6) Avail: NTIS HC A10/MF A01 CSCL 09/2

In this thesis a method for generating realistic scenes by computer graphics was investigated. The algorithm which was used was a ray tracing algorithm. The scenes it was capable of rendering included those containing transparent and reflective surfaces. The implemented surface types were planar polygons and spheres. Minor surface irregularities were simulated for specular reflection from light sources. The resulting package was added to an implementation of a CORE graphics system (written in PASCAL) to serve as its hidden surface removal facility. GRA

N85-28626# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
SOFTWARE ENVIRONMENT FOR CONDUCTING INTERACTIVE STATISTICAL ANALYSIS M.S. Thesis
M. F. Amell 14 Dec. 1984 106 p
(AD-A153378; AFIT/GCS/MATH/84D-2) Avail: NTIS HC A06/MF A01 CSCL 12/1

This thesis developed a software environment for conducting statistical analysis of exponential failure models interactively. Exponential failure models will work for small amounts of data and are particularly valuable when gathering large amounts of data is not practical, such as loss of lives or airplanes. The design of the system down to individual modules demonstrated that by using the software engineering techniques explored, an environment can be efficiently created. The approach used in this project not only created a valuable tool, but it's use is encouraged in further developments for other distributions. GRA

N85-28627# Systems Planning Corp., Arlington, Va.
EVIDENTIAL REASONING IN EXPERT SYSTEMS FOR IMAGE ANALYSIS Final Technical Report, Jun. - Dec. 1984
T. R. Thompson Feb. 1985 98 p
(Contract DACA72-84-C-0006)
(AD-A153379; ETL-0381) Avail: NTIS HC A05/MF A01 CSCL 09/2

This report documents efforts to understand approaches to evidential reasoning of use in application of expert-system or knowledge-based-system techniques to image analysis (IA). There is growing evidence that these techniques offer significant improvements in image analysis, particularly in the coordinated application of specialized algorithms. This effort has four principal goals: (1) to clarify the basic issues in evidential reasoning (ER), (2) to provide a common framework for analysis, (3) to structure the ER process for major expert-system tasks in image analysis, and (4) to identify promising directions for further research. This research was carried out in three major segments. The first segment structured the evidential reasoning problem in a formal paradigm robust enough to be of practical use in design and construction of expert systems. It then formulated six important theoretical approaches in a parallel fashion in order to identify key assumptions, similarities, and differences. The second segment applied each of the ER approaches to three important tasks for expert systems in the domain of image analysis. This segment concluded with an assessment of the strengths and weaknesses of each approach. The third segment addressed promising directions for further research. It reviewed current results and identified important questions bearing on successful application of expert-system technology to image analysis. GRA

N85-28628# Sandia Labs., Albuquerque, N. Mex. Fluid Mechanics and Heat Transfer Div.
TRINITY: A PRE- AND POST-PROCESSING PROGRAM FOR 2-DIMENSIONAL FINITE ELEMENT DATA
David K. Gartling Feb. 1985 46 p refs
(Contract DE-AC04-76DP-00789)
(DE85-008029; SAND-84-2090) Avail: NTIS HC A03/MF A01

TRINITY is an interactive pre and post processing program for use with two dimensional finite element codes. The program is interfaced with a family of heat transfer and fluid mechanics codes that are presently in use. The program provides interactive graphical display of mesh and solution data, computation of auxiliary solution data and the provision for file editing and formatting. The capabilities and use of the program are described. DOE

N85-28629# Argonne National Lab., Ill. Mathematics and Computer Science Div.
SOFTWARE FOR ESTIMATING SPARSE HESSIAN MATRICES
T. F. Coleman (Cornell Univ.), B. S. Garbow, and J. J. More Dec. 1984 75 p refs
(Contracts W-31-109-eng-38; DE-AC02-83ER-13069)
(DE85-008121; ANL/MCS-TM-43) Avail: NTIS HC A04/MF A01

The solution of a nonlinear optimization problem often requires an estimate of the Hessian matrix for a function f. In large scale problems the Hessian matrix is usually sparse, and then estimation by differences of gradients is attractive because the number of differences can be small compared to the dimension of the problem. A set of subroutines whose purpose is to estimate the Hessian matrix with the least possible number of gradient evaluations is described. DOE

N85-28630# Sandia Labs., Albuquerque, N. Mex. Fluid Mechanics and Heat Transfer Div.
NUMERICAL BENCHMARK STUDY FOR THE FINITE ELEMENT COMPUTER CODE NEPTUNE
D. F. McTigue and P. R. Dawson (Cornell Univ.) Feb. 1985 52 p refs
(Contract DE-AC04-76DP-00789)
(DE85-008400; SAND-84-0470) Avail: NTIS HC A04/MF A01

NEPTUNE is a finite element computer code developed for the Subseabed Disposal Program to provide calculations of long term sediment deformation and pore fluid flow. A benchmark study was completed as part of the code verification process. The study is based on calculations of free convection in a rectangular region with an end to end temperature difference. Two limiting cases are considered, one approximating Darcy flow in a rigid porous medium, and the other approaching the flow of a single phase, linearly viscous fluid. Results from these calculations are compared to independent results using the more specialized, but thoroughly tested, codes MARIAH and NACHOS. Comparisons of velocity and temperature fields are excellent, with noticeable discrepancies only at Rayleigh numbers several order of magnitude greater than those expected in a typical subseabed disposal scenario. The calculations are extended successfully into a realm in which both convection of the skeleton and relative motion of the pore fluid contribute significantly to the heat transfer. DOE

N85-28631# California Univ., Livermore. Lawrence Livermore Lab.
VULTURE MANUAL
Miles L. Loyd 25 Feb. 1985 41 p refs
(Contract W-7405-eng-48)
(DE85-008873; UCID-20371) Avail: NTIS HC A03/MF A01

VULTURE is a one dimensional electrostatic particle and field code to simulate electron beam devices such as klystrons or virtual cathode oscillators. It uses particle and cell calculation methods. VULTURE includes the relativistic motion of electrons and the nonrelativistic motion of protons and ions. The one dimensional model may be thought of as particle sheets parallel to the y-z plane moving in the x direction. Electric field, charge density and potential are calculated as a function of x. No magnetic fields are included and the plasma is collisionless. The model is bounded by end plates at x=0 and at a maximum value of x. These end plates are referred to as grids. Additional grids may be located within these bounds, and external circuits connected between the grids provide for the simulation of microwave cavities. Electrical energy is extracted by resistive loss in these circuits. In addition to initial electron, proton and ion conditions, electrons can be emitted and absorbed by all grids including the model boundaries. This electron emission can be varied in both spectrum and time for each grid. DOE

N85-28632# Stanford Linear Accelerator Center, Calif.
INTRODUCTION TO LINE: A FEYNMAN DIAGRAM GRAPHIC OPERATOR
Bruce LeClaire Mar. 1985 70 p
(Contract DE-AC03-76SF-00515)
(DE85-009299; SU-SLAC-TN-85-1) Avail: NTIS HC A04/MF A01

An executive program for making Feynman graphs of amazing complexity with amazing simplicity is described. The LINE exec works iteratively, repeatedly prompting the use for the elements of the graph. Each line is plotted in a 10 x 10 Cartesian coordinate system using two ordered pairs of coordinates, (x1,y1) and (x2,y2), as endpoints. The types of lines that can be drawn include fermions, scalars, photons, gluons, W or Z hosons. As each line is added the exec allows the user to display the updated picture, and to erase the last line added (if necessary). DOE

N85-28633# Oak Ridge Y-12 Plant, Tenn.
EFFORTS AT OFFICE AUTOMATION AND INFORMATION SYSTEMS UTILIZATION AT MARTIN MARIETTA ENERGY SYSTEMS, INCORPORATED
C. A. Reeves, Jr. 1 Mar. 1985 50 p refs Presented at 32nd

PSI Ann. Secretarial Inst., Knoxville, Tenn., 6 Mar. 1985
(Contract DE-AC05-84CS-21400)
(DE85-008154; Y/DL-914; CONF-8503118-1) Avail: NTIS HC A03/MF A01

A brief history is given of the efforts at utilization of mainframe computers, personal or desktop computers, standalone word processors, and other such devices at Martin Marietta Energy Systems in Oak Ridge, Tennessee. This discussion is concentrated on how these systems have been used in the office, both for purely technical and management oriented applications. Some detail is also given on how these systems have been used to solve some typical problems in offices, so that others might benefit from lessons learned. DOE

N85-28634# Stanford Linear Accelerator Center, Calif.
THERE IS NO I/O LIKE NO I/O
T. Y. Johnston Jan. 1985 8 p Presented at the Candle Users Group Meeting, Los Angeles, 21 Feb. 1985
(Contract DE-AC03-76SF-00515)
(DE85-009115; SU-SLAC-PUB-3665; CONF-850272-1) Avail: NTIS HC A02/MF A01

On most computer systems the most common cause of performance degradation is I/O contention. Some efforts that can be taken in a VM environment to reduce I/O or its effect at both the global and local levels are examined. DOE

N85-28635# Fermi National Accelerator Lab., Batavia, Ill.
CAMAC 488 MODULE: 68000 BASED GPIB INTERFACE MODULE
K. C. Seino Mar. 1985 39 p refs
(Contract DE-AC02-76CH-03000)
(DE85-009367; FNAL-TM-1298) Avail: NTIS HC A03/MF A01

The kind of hardware and software to be used to interface GPIB devices with the existing computer system was discussed. The use of a commercially available Multibus card, BLC 8488 from National Semiconductor, whose on board Z80 would manage the GPIB read/write functions and handshakes was discussed. With this card, one can make a hardware system which consists of: (1) CAMAC 080; (2) Multibus crate; (3) M. Shea's M68000; (4) M080; (5) BLC 8488; and (6) memory board. The software considered for such a hardware package was GAS, which was an established software package for communication between the ACNET computer system and smart CAMAC modules. However, a second idea is to put everything on a two wide CAMAC module. The second idea was pursued resulting in a two wide CAMAC module called C488. The hardware - block diagrams, circuit blocks, front panel and hardware tests are described and the software - system, modules and application are referred to. DOE

N85-28636# Technische Hogeschool, Delft (Netherlands). Dept. of Mathematics and Informatics.
RAY TRACING GENERAL SWEEP DEFINED OBJECTS
W. F. Bronsvoort and F. Klok 1984 21 p refs
(Rept-84-36) Avail: NTIS HC A02/MF A01

An algorithm for ray tracing objects defined by sweeping an arbitrary 2D contour along an arbitrary 3D trajectory is presented. General sweep-defined objects are defined in terms of the Frenet frame of the trajectory. Computation of the intersection points with a ray is reduced to the problem of intersecting two 2D curves and solved by a subdivision algorithm. The 3D normal at the intersection point closest to the eye point, necessary to perform shading, is obtained by transforming the 2D normal at the corresponding intersection point of the two 2D curves. In this way it is possible to obtain highly realistic images for a very broad class of objects. Author (ESA)

N85-28637# Technische Hogeschool, Delft (Netherlands). Dept. of Mathematics and Informatics.
THE INTERFACE WITH DECISION MAKERS IN INTERACTIVE MULTIOBJECTIVE LINEAR PROGRAMMING
M. Kok 1984 40 p refs
(Rept-84-38) Avail: NTIS HC A03/MF A01

The mathematical formulation of interactive multiobjective linear programming methods is investigated, showing that they are all based on weighting, constraint, or reference point scalarization. Interactive methods in each class of scalarization are presented and illustrated with a numerical example. The type and amount of information given by decision makers in the interactive methods are discussed. It is shown that in many applications, weighting methods do not fully recognize that the ability of a decision maker to oversee a large number of stimuli is limited. Author (ESA)

N85-28638# Center for Mathematics and Computer Science, Amsterdam (Netherlands). Dept. of Computer Science.
A COMPLETE INFERENCE SYSTEM FOR REGULAR PROCESSES WITH SILENT MOVES
J. A. Bergstra and J. W. Klop Nov. 1984 63 p refs Submitted for publication Sponsored by ESPRIT contract METEOR
(CWI-CS-R8420; B8561784) Avail: NTIS HC A04/MF A01

Bisimulation between process graphs with silent or invisible steps (tau steps) was studied. The analysis provides a normalization or minimalization result for regular processes, and leads to a complete proof system for regular processes with tau-steps and subject to operations + (alternative composition), . (sequential composition) and // (parallel composition or free merge), thereby proving the consistency of a version of Koomen's fair abstraction rule. It is shown that joining Milner's tau-laws to a regular process without tau-steps does not result in a complete proof system for regular processes with tau steps. Author (ESA)

N85-28639# Center for Mathematics and Computer Science, Amsterdam (Netherlands). Dept. of Computer Science.
TOWARDS A UNIFORM TOPOLOGICAL TREATMENT OF STREAMS AND FUNCTIONS ON STREAMS
J. W. deBakker and J. N. Kok Nov. 1984 22 p refs Submitted for publication
(Grant ZWO-125-20-40)
(CWI-CS-R8422; B8561783) Avail: NTIS HC A02/MF A01

The semantics of functional languages on streams such at Turner's SASL or KRC are studied. The basis of these languages is recursive equations for (functions on) finite sequences. A mathematical (denotational) description of such languages using tools from metric topology, based on the Banach fixed point theorem and a restricted version of a typed lambda calculus is suggested. To a system of recursive stream (function) declarations a system of functions is associated in an appropriate topological domain. These functions have to be contracting in certain arguments and non distance increasing in others; a syntax which ensures the right interplay between these conditions is designed. Nondeterminism is handled by considering compact sets of streams. Preservation of compactness is considered. Author (ESA)

N85-28640# Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany).
DEVELOPMENT OF NEW CIRCUIT SYMBOLS FOR BINARY LOGIC ELEMENTS [NEUE SCHALTZEICHEN FUER BINAERE LOGIK-ELEMENTE]
S. F. J. deMelo 1985 57 p refs In GERMAN Submitted for publication
(MBB-Z-39/85-O) Avail: NTIS HC A04/MF A01

Symbols allowing a clear and readable representation of complicated integrated circuits in current flow diagrams are presented. The outlines of the circuits are replaced by a rectangle for binary and analog elements. The main function of the circuit is symbolized in a rectangle. Other information can be given besides the symbol of the main function more easily than in the crescents. The symbols and symbol combination for logic signals, binary logical elements and composed circuits as well as particularities in the representation of the logic elements are presented. Author (ESA)

N85-28641# Kernforschungsanlage, Juelich (West Germany). Zentrallabor fuer Elektronik.
A PROGRAMMING SYSTEM FOR A MODULAR FLEXIBLE MULTIMICROCOMPUTER SYSTEM FOR THE AUTOMATIC CONTROL OF AUTOMATED TEST EQUIPMENT

J. Schmidt Nov. 1984 131 p refs In GERMAN; ENGLISH summary
(JUEL-1962; ISSN-0366-0885) Avail: NTIS HC A07/MF A01

A computer programming system was developed to supply the operation required for the control of complex automated test equipment with a multimicrosystem. The hardware used is operation oriented consisting of self operating microcomputer modules connected with a parallel system bus. A multimicrocomputer operating system allowing communication between the modules and synchronization of their activities and meeting the data processing demands (real time handling of the process events and operation of several parallely running subprocesses) was developed. A programming language consisting of commands and a syntax easily learned by the operators was developed, as well as a structural system for implementation of an application oriented programming language. The flexibility of the programming system is due to its modular structure and its efficiency is demonstrated by industrial pilot scale implementation. Author (ESA)

N85-28858# Arizona State Univ., Tempe.
COMPUTING IN THE SOVIET GENERAL ECONOMY: AN INTRODUCTORY OVERVIEW
S. E. Goodman and W. K. McHenry *In* Stanford Univ. Sci. and Technol. in the Soviet Union 31 Jan. 1985 p 41-52 (For primary document see N85-28856 17-81)
(AD-P004563) Avail: NTIS HC A10/MF A01 CSCL 05/1

62 COMPUTER SYSTEMS

Includes computer networks.

N85-28642*# Mississippi State Univ., Mississippi State. Dept. of Electrical Engineering.
SYSTEM ANALYSIS FOR THE HUNTSVILLE OPERATION SUPPORT CENTER, DISTRIBUTED COMPUTER SYSTEM Interim Report, Mar. - Jun. 1985
F. M. Ingels and D. Massey 1985 207 p
(Contract NAS8-34906)
(NASA-CR-171506; NAS 1.26:171506) Avail: NTIS HC A10/MF A01 CSCL 09B

HOSC as a distributed computing system, is responsible for data acquisition and analysis during Space Shuttle operations. HOSC also provides computing services for Marshall Space Flight Center's nonmission activities. As mission and nonmission activities change, so do the support functions of HOSC change, demonstrating the need for some method of simulating activity at HOSC in various configurations. The simulation developed in this work primarily models the HYPERchannel network. The model simulates the activity of a steady state network, reporting statistics such as, transmitted bits, collision statistics, frame sequences transmitted, and average message delay. These statistics are used to evaluate such performance indicators as throughout, utilization, and delay. Thus the overall performance of the network is evaluated, as well as predicting possible overload conditions. Author

N85-28643*# Michigan Univ., Ann Arbor. Dept. of Electrical Engineering and Computer Science.
OPTIMAL DESIGN AND USE OF RETRY IN FAULT TOLERANT REAL-TIME COMPUTER SYSTEMS
Yann-Hang Lee and Kang G. Shin Aug. 1983 44 p refs
(Grant NAG1-296)
(NASA-CR-175920; NAS 1.26:175920) Avail: NTIS HC A03/MF A01 CSCL 09B

A new method to determin an optimal retry policy and for use in retry of fault characterization is presented. An optimal retry policy for a given fault characteristic, which determines the maximum allowable retry durations to minimize the total task completion time was derived. The combined fault characterization and retry decision, in which the characteristics of fault are estimated simultaneously with the determination of the optimal retry policy were carried out. Two solution approaches were developed, one based on the point estimation and the other on the Bayes sequential decision. The maximum likelihood estimators are used for the first approach, and the backward induction for testing hypotheses in the second approach. Numerical examples in which all the durations associated with faults have monotone hazard functions, e.g., exponential, Weibull and gamma distributions are presented. These are standard distributions commonly used for modeling analysis and faults. E.A.K.

N85-28644*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
SYNCHRONIZATION AND FAULT-MASKING IN REDUNDANT REAL-TIME SYSTEMS
C. M. Krishna (Michigan Univ., Ann Arbor), Kang G. Shin (Michigan Univ., Ann Arbor), and Ricky W. Butler 14 Nov. 1983 34 p refs
(Grant NAG1-296)
(NASA-TM-87478; NAS 1.15:87478) Avail: NTIS HC A03/MF A01 CSCL 09B

A real time computer may fail because of massive component failures or not responding quickly enough to satisfy real time requirements. An increase in redundancy - a conventional means of improving reliability - can improve the former but can - in some cases - degrade the latter considerably due to the overhead associated with redundancy management, namely the time delay resulting from synchronization and voting/interactive consistency techniques. The implications of synchronization and voting/interactive consistency algorithms in N-modular clusters on reliability are considered. All these studies were carried out in the context of real time applications. As a demonstrative example, we have analyzed results from experiments conducted at the NASA Airlab on the Software Implemented Fault Tolerance (SIFT) computer. This analysis has indeed indicated that in most real time applications, it is better to employ hardware synchronization instead of software synchronization and not allow reconfiguration. Author

N85-28645# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
INTERFACING THE VAX 11/780 USING BERKELEY UNIX 4.2.BSD AND ETHERNET BASED XEROX NETWORK SYSTEMS, VOLUME 1 M.S. Thesis
E. Bernard Dec. 1984 162 p 3 Vol.
(AD-A152953; AFIT/GCS/ENG/84D-4-Vol-1) Avail: NTIS HC A08/MF A01 CSCL 09/2

Although mainframe computers are accessible online and are the mainstay of the computing power offices use, they are not used for processing all of the information that must be managed in an office. Mainframe computers are used primarily by offices for maintaining large databases and doing number crunching. This is mainly because it is the most cost effect way to use these very expensive computer systems. The evolution of computers has produced new computer devices that can be used in offices. Word processing computers enable secretaries to produce and maintain documents more efficiently. Workstation computers give professionals tools that assist them in the performance of their duties. Workstation computers are also used for data processing. Microcomputers are used in special applications where a limited amount of computing power is needed. These new computers that have been added to the office are referred to as office automation computers. The introduction of all of these new computers to the office created a need to share information among them. Local area networks allow autonomous computing devices the ability to share information. The Program and Financial Control office has already installed a Xerox Ethernet local area network. This network has Xerox office automation computers such as workprocessors, wordstations, laser printers, and microcomputers connected to it, but there is also a need for using a mainframe computer for data processing. GRA

N85-28646# Naval Postgraduate School, Monterey, Calif.
A REAL-TIME EXECUTIVE FOR MULTIPLE-COMPUTER CLUSTERS M.S. Thesis
D. J. Brewer Dec. 1984 227 p

(AD-A152961) Avail: NTIS HC A11/MF A01 CSCL 09/2

This thesis extends the multicomputer real-time executive, MCORTEX, for a cluster of single board computers (INTEL iSBC 86/12 86/12) on the MULTIBUS, to a multiple cluster system tied together by a Local Area Network (Ethernet). The E-MCORTEX system uses eventcounts and sequencers to synchronize processes resident in the network. Data communications between processes are presently limited to a single cluster with shared memory. However, future versions of E-MCORTEX will permit network-wide process synchronization and data communication.
GRA

N85-28647# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.

INTERFACING THE VAX 11/780 USING BERKELEY UNIX 4.2BSD AND ETHERNET BASED XEROX NETWORK SYSTEMS M.S. Thesis

C. E. Bernard Dec. 1984 231 p

(AD-A153174; AFIT/GCS/ENG/84D-4) Avail: NTIS HC A11/MF A01 CSCL 09/2

The Program and Financial Control (P&FC) office would like to be able to perform electronic filing, mailing, and printing services between the VAX 11/780, using the Berkeley Unix 4.2BSD operating system, and Ethernet based Xerox Network Systems (XNS). This study researched the implementation of an electronic filing service between the VAX 11/780 and Ethernet based XNS systems. This study also researched implementations of the DARPA TCP/IP protocols on the VAX 11/780, because P&FC is mandated by DOD to use these protocols for internetworking systems. This study began by outlining the protocol specifications required for interfacing with XNS systems. An extensive literature search was then performed to determine which of the XNS protocol specifications, as well as the TCP/IP protocols, were already implemented for the VAX 11/780. It was found that Berkeley Unix 4.2BSD contains an implementation of TCP/IP. It was also found that the Xerox Bulk Data Transfer Protocol, a protocol used by the electronic filing service to transfer files, was not implemented. Therefore, a design, implementation, and testing of the Bulk Data Transfer Protocol were presented. With the design and implementation presented, most of the protocols needed to implement an electronic filing service on the VAX 11/780 exist. However, Xerox has not yet released its electronic filing protocol for public use.
GRA

N85-28648# Wisconsin Univ., Madison.

MULTICOMPUTER OPERATING SYSTEMS AND APPLICATIONS Final Report

R. A. Finkel and M. H. Solomon Mar. 1985 326 p

(Contract N00014-82-C-2087; DARPA Order 5049)

(AD-A153205) Avail: NTIS HC A15/MF A01 CSCL 09/2

Various aspects of multicomputer operator systems and applications are discussed. Topics covered include: The Charlotte Distributed Operating System: Part 4 of the First Report on the Crystal Project; Charlotte: Design and implementation of a distributed kernel; Interprocess communication in Charlotte; A framework for the evaluation of high-level languages for distributed computing; LYNX: A dynamic distributed programming language; A simple mechanism for type security across compilation units; Automatic generation of communication protocols; The use of timing graphs for distributed program debugging; Timing errors in distributed programs; Checkers on Charlotte; Internal memorandum; An adaptive load balancing algorithm for a multicomputer; DIB - A distributed implementation of backtracking; A taxonomy of distributed algorithms; An efficient deadlock avoidance algorithm; Extension of the Banker's Algorithm for Resource Allocation in a Distributed Operating System; Deadlock-free resource allocation schemes for distributed operating systems; and A note on starvation-control policies.
R.J.F.

N85-28649# Dynamics Research Corp., Wilmington, Mass.

DEFENSE DATA NETWORK SUPPORT CONCEPT ANALYSIS Final Technical Report, Sep. - Dec. 1984

L. Cohen, W. J. Miller, and S. A. Greene 26 Dec. 1984 90 p

(Contract F19628-84-D-0016)

(AD-A153214; E-9597U) Avail: NTIS HC A05/MF A01 CSCL 05/1

This report contains an analysis of alternative support concepts for the evolving Defense Data Network. The alternatives analyzed were sole source contractor support, competitively procured contractor support, organic on-site and contractor off-site support, and organic support. The conclusions and recommendations regarding support concepts are based on estimates of incremental Operations and Support costs and subjective and other nonquantifiable factors.
GRA

N85-28650# Center for Mathematics and Computer Science, Amsterdam (Netherlands). Dept. of Computer Science.

THE DESIGN OF A CAPABILITY-BASED DISTRIBUTED OPERATING SYSTEM

Sape J. Mullender and Andrew S. Tannebaum (Vrije Univ., Amsterdam) Oct. 1984 22 p refs

(CWI-CS-R8418; B8478820) Avail: NTIS HC A02/MF A01

A capability-based operating system for fifth generation computer systems using a large numbers of processors was designed. Capability management is done entirely by user programs without giving up any of the protection aspects normally associated with capabilities. The system uses one-way functions and encryption to protect sensitive information. It employs the Amoeba file system.
Author (ESA)

N85-28651# Center for Mathematics and Computer Science, Amsterdam (Netherlands). Dept. of Computer Science.

DISTRIBUTED SYSTEMS MANAGEMENT IN WIDE AREA NETWORKS

Sape J. Mullender Nov. 1984 13 p refs Presented at NGI-SION Inform. Symp., 1984

(CWI-CS-R8419; B8478819) Avail: NTIS HC A02/MF A01

The management and interaccessability of European distributed networks was studied. Models for distributed systems as a context within which management activities can be considered were identified. Management tools for the planning and organization of distributed processing were considered. Mechanisms through which managers can apply their policy to control and use resources, through optimization and authorization strategies were outlined. Protocols for the control of resources, protocols which maintain resource availability, and protocols which signal system failure were identified.
Author (ESA)

N85-28652# Center for Mathematics and Computer Science, Amsterdam (Netherlands). Dept. of Computer Science.

DISTRIBUTED MATCHMAKING FOR PROCESSES IN COMPUTER NETWORKS

S. J. Mullender and P. M. B. Vitanyi Dec. 1984 19 p refs Preliminary version

(CWI-CS-R8421; B8561781) Avail: NTIS HC A02/MF A01

Methods for locating services in computer networks that are less expensive than broadcasting in terms of message passes or hops are examined. The complexity in terms of storage, message passes, and processing needed is investigated. The problem consists of distributed matchmaking between processes, such as server processes and client processes. The processes are assumed to be mobile and not to have fixed addresses. When the servers assist the clients in getting themselves found, it appears that, in many mesh networks, matchmaking can be done in O (sq root N) message passes, where N is the number of nodes in the network. Conventional broadcast methods for locating services need a minimum of O(N) message passes to do the broascast. The theoretical limitations of distributed matchmaking are established, and the techniques are applied network topologies. Author (ESA)

N85-28653# Center for Mathematics and Computer Science, Amsterdam (Netherlands). Dept. of Computer Science.

DISTRIBUTED ELECTIONS IN A RING OF PROCESSORS USING ARCHIMEDEAN TIME

Paul M. B. Vitanyi Oct. 1984 16 p refs Presented at 16th Ann. ACM Symp. on Theory of Computing, Washington, D.C., 3-5 May

1985 Submitted for publication
(CWI-CS-R8416; B8478822) Avail: NTIS HC A02/MF A01

A logically time-independent (unidirectional deterministic) solution using order sN message passes in the worst case, with s a measure of the asynchronicity of the system is given for distributed elections in a ring of processors. For synchronous systems s = 1 and even for asynchronous systems, s can be eliminated by choice of parameters in the protocol. The result depends on the processors using subjective clocks but its correctness and termination is independent of the time assumptions. The known nonlinear average-case lower bound on the number of message passes is cracked by the worst-case performance of the solution. For the synchronous case, in which the necessary assumptions hold a fortiori, the method is, asymptotically, of optimal order of magnitude. The deterministic algorithm is of asymptotically optimal bit complexity, and, in the synchronous case, also yields an optimal bound to determine the ring size. A result on distributed sorting in unidirectional rings is discussed.
Author (ESA)

63 CYBERNETICS

Includes feedback and control theory.
For related information see also *54 Man/System Technology and Life Support.*

N85-28654# Software Architecture and Engineering, Inc., Arlington, Va.
APPLICATION OF ARTIFICIAL INTELLIGENCE (AI) TO RADAR IMAGE UNDERSTANDING Final Report, 1 Apr. - 31 Dec. 1984
D. T. Franks, J. A. Musselman, and J. W. Sapp 28 Feb. 1985 44 p
(Contract N00014-84-C-0463)
(AD-A152519; SAE-DC-85-R-004; ETL-0387) Avail: NTIS HC A03/MF A01 CSCL 06/4

This report describes applied research into the application of artificial intelligence (AI) techniques to the problems associated with the extraction of terrain features from synthetic aperture radar (SAR) images. Specific AI techniques have been implemented and analyzed. They have given positive results. A conceptual model for an image-understanding system is described. The model provides the framework for a flexible experimental image-understanding research tool as well as potential for growth to an operational system. GRA

N85-28655# Technische Hogeschool, Delft (Netherlands). Dept. of Mathematics and Informatics.
LARGE SCALE ELECTRICITY PRODUCTION SCHEDULING VIA NONLINEAR OPTIMIZATION
P. P. J. vandenBosch and F. A. Lootsma 1984 15 p refs
(Rept-84-07) Avail: NTIS HC A02/MF A01

Methods for nonlinear optimization in the daily scheduling of electricity production are proposed for problems with a nonlinear cost function, lower and upper bounds on the variables, and an equality constraint. If the cost function is quadratic, a modified Lagrange multiplier technique is used for a nonquadratic cost function, conjugate search directions and a projection method are used. Numerical examples demonstrate the effectiveness of the approach for problems with hundreds of variables. Author (ESA)

64 NUMERICAL ANALYSIS

Includes iteration, difference equations, and numerical approximation.

N85-28656*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
CONVERGENCE OF NEWTON'S METHOD FOR A SINGLE REAL EQUATION
C. Warren Campbell Jun. 1985 23 p refs
(NASA-TP-2489; NAS 1.60:2489) Avail: NTIS HC A02/MF A01 CSCL 12A

Newton's method for finding the zeroes of a single real function is investigated in some detail. Convergence is generally checked using the Contraction Mapping Theorem which yields sufficient but not necessary conditions for convergence of the general single point iteration method. The resulting convergence intervals are frequently considerably smaller than actual convergence zones. For a specific single point iteration method, such as Newton's method, better estimates of regions of convergence should be possible. A technique is described which, under certain conditions (frequently satisfied by well behaved functions) gives much larger zones where convergence is guaranteed. Author

N85-28657# Cranfield Inst. of Tech., Bedford (England). Dept. of Applied Computing and Mathematics.
GENERALISED TRANSLATION INVARIANCE AND SYSTEMS THEORY
R. F. Hoskins and J. Sousa Pinto (Aveiro Univ., Coimbra, Portugal) Mar. 1985 32 p
(CRM-8501; ISBN-0-947767-169) Avail: NTIS HC A03/MF A01

A linear system which is translation-invariant can be characterized very simply in the time-domain by a convolution operator and in the frequency-domain by a transfer function. The concept of translation-invariance is generalized as to define other classes of linear systems which exhibit at least some of the simplifying features of the translation-invariant case. After a review of the general theory of the representation of translation varying linear systems, the effect of introducing a postulate of invariance with respect to a generalized translation operation is considered. This is illustrated by an application to the so-called 'stretch-invariant' linear systems introduced within the last decade. In the final section an appropriate theory of generalized convolution is developed, together with a corresponding transform theory. G.L.C.

N85-28658*# Carnegie-Mellon Univ., Pittsburgh, Pa. Dept. of Electrical and Computer Engineering.
A HIGH-ACCURACY OPTICAL LINEAR ALGEBRA PROCESSOR FOR FINITE ELEMENT APPLICATIONS Final Report
David Casasent and Bradley K. Taylor 16 Nov. 1984 168 p refs
(Grant NAG1-409)
(NASA-CR-175894; NAS 1.26:175894) Avail: NTIS HC A08/MF A01 CSCL 12A

Optical linear processors are computationally efficient computers for solving matrix-matrix and matrix-vector oriented problems. Optical system errors limit their dynamic range to 30-40 dB, which limits their accuray to 9-12 bits. Large problems, such as the finite element problem in structural mechanics (with tens or hundreds of thousands of variables) which can exploit the speed of optical processors, require the 32 bit accuracy obtainable from digital machines. To obtain this required 32 bit accuracy with an optical processor, the data can be digitally encoded, thereby reducing the dynamic range requirements of the optical system (i.e., decreasing the effect of optical errors on the data) while providing increased accuracy. This report describes a new digitally encoded optical linear algebra processor architecture for solving finite element and banded matrix-vector problems. A linear static plate bending case study is described which quantities the processor requirements. Multiplication by digital convolution is explained, and the digitally encoded optical processor architecture is advanced. B.W.

N85-28659# Army Engineer Waterways Experiment Station, Vicksburg, Miss. Hydraulics Lab.
A DISCUSSION OF ADAPTIVE GRIDS AND THEIR APPLICABILITY IN NUMERICAL HYDRODYNAMIC MODELING Final Report
B. H. Johnson, J. F. Thompson, and A. J. Baker Sep. 1984 88 p
(DA Proj. 4A0-61101-A-91-D)
(AD-A151843; WES/MP/HL-84-4) Avail: NTIS HC A05/MF A01 CSCL 12/1

This investigation assessed the usefulness of adaptive grids in numerical solution of free surface hydrodynamics with particular problems expected to occur in the use of adaptive grids in hydrodynamic modeling, e.g., the need for interpolation of the bottom topography on a moving grid. Methods of grid generation, as well as implementation of adaptive grids, were considered for both finite difference and finite element solution methods. In general, it can be concluded that adaptive grids offer significant potential for more accurate solutions at less cost when modeling the behavior of surges, hydraulic jumps, and concentration fronts, i.e., perturbation problems containing only a few high gradient regions in the computational domain at any time. However, for problems such as propagation of short waves in coastal regions, where many wavelengths occur in the physical domain of interest at a particular time, adaptive grids offer little or no advantage since gradients occur over essentially the complete domain. Some of the greatest potential for adaptive grid techniques in hydrodynamic modeling lies in its use to numerically generate fixed grids in tidal circulation studies. GRA

N85-28660# Maryland Univ., College Park. Dept. of Mathematics.
DECONVOLUTION METHODS FOR MULTI-SENSORS Final Report, Mar. - Oct. 1984
C. A. Berenstein, P. S. Krishnaprasad, and B. A. Taylor 13 Oct. 1984 71 p
(Contract DAAG29-81-D-0100; DA Proj. 1L1-61102-A-31-B)
(AD-A152351) Avail: NTIS HC A04/MF A01 CSCL 12/1

This report examines the multi-sensor approach to the deconvolution problem. The mathematical model for this problem replaces a single convolution equation by a system of convolution equations, each equation a convolution of a different convolutor with the original, unknown function. Thus, there are several data functions, The different convolutors might be obtained, for instance, by changing the detector size, by changing the horizontal; or vertical scan rates, or by using different optical devices. The work of Berenstein, Taylor, and Yger, shows that for suitable systems of convulation operators, there are exact deconvulators: that is, there are distributions of compact support such that the sum of their convolutions with the data functions is the original function, Further, the size of the support of the deconvolutors is proportional to the size of the support of the convolutors. Thus, the inverse map from the data to the unknown function is well-defined without any assumptions about the support or size of the unknown function. Originator-supplied keywords include: Convolution, deconvolution, images, image reconstruction, image restoration, image processing, multi-sensors, multi-detectors, mathematics, mathematical analysis, fourier analysis, functional analysis, numerical analysis, transformations(mathematics), convolutional integral, Bezout problem. GRA

N85-28661# Yale Univ., New Haven, Conn. Dept. of Computer Science.
EFFICIENT PARALLEL SOLUTION OF LINEAR SYSTEMS WITH HYPERBOLIC ROTATIONS
J. M. Delosme and I. C. F. Ipsen Nov. 1984 35 p
(Contracts N00014-82-K-0184; N00014-84-K-0092)
(AD-A152355; YALEU/DCS/RR-341) Avail: NTIS HC A03/MF A01 CSCL 12/1

An algorithm based on hyperbolic rotations is presented for the solution of linear systems of equations, Ax = b, with symmetric positive definite coefficient matrix A. Forward elimination and backsubstitution are replaced by matrix vector multiplications, rendering the method most amenable to implementation on a variety of parallel and vector machines. The stability behavior compares favorably with that of the best, known methods. The method can be simplified and formulated without square roots if A is also Toeplitz; a corresponding systolic architecture (in very large scale integrated circuits) for the resulting recurrence equations is more efficient than previously proposed pipelined Toeplitz system solvers. The hardware count becomes independent of the matrix size if its inverse is banded. GRA

N85-28662# RAND Corp., Santa Monica, Calif.
A FORMAL ANALYSIS OF THE EVOLUTION OF COOPERATION
J. A. K. Cave Oct. 1984 24 p
(AD-A152539; RAND/P-7031) Avail: NTIS HC A02/MF A01 CSCL 12/1

We examine a formal model of the way a growing population selects behavior. The members of the population engage in randomly-selected binary interactions, with payoffs representing a Prisoners' Dilemma. We assume that players can recognize each other if they have met before, and adopt one of two dynamic strategies; they either play the non-cooperative strategy (G) at every move, which we denote D, or they play a tit-for-tat strategy, in which they begin by playing the cooperative move(C) and continue playing C if the opponent's last move was C and G if the opponent's last move was G. This latter strategy is denoted T. The interactions are repeated, and two players meet again with probability delta epsilon (0,1). Formally, it is as if each player met a random member of the population and played a discounted supergame with discount factor delta forever afterwards. We assume that the population and the mix of behaviors changes over time in a simple fashion. These qualitative dynamics will allow us to say something about the stability of various regimes of behavior in terms of population size and behavior. The organization of the paper is as follows. Section II contains the model and definitions, and examines the evolution of cooperative behavior for the special case of a static population. Section III combines the dynamics of behavior with those of population growth. Finally, Section IV relates the present results to results of repeated play where players are rational. GRA

N85-28663# Harvard Univ., Cambridge, Mass. Center for Research in Computer Technology.
EFFICIENT PARALLEL SOLUTION OF LINEAR SYSTEMS
V. Pan and J. H. Reif Mar. 1985 43 p
(Contract N00014-80-C-0647)
(AD-A152663; TR-02-85) Avail: NTIS HC A03/MF A01 CSCL 12/1

The most efficient known parallel algorithms for inversion of a nonsingular nxn matrix A or solving a linear system Ax=b over the rationals require O(log n) to the 2nd power time and M(n) square root of n processors (where M(n) is the number of processors required in order to multiply two nxn rational matrices in time O(log n)). Furthermore, all known polylog time algorithms for those problems are unstable: they require the calculations to be done with perfect precision; otherwise they give no results at all. This paper describes parallel algorithms that have good numerical stability and remain efficient as n grows large. GRA

N85-28664# University of Southern California, Los Angeles. Dept. of Mathematics.
DISCRETE MATHEMATICS FOR COMMUNICATIONS SYSTEMS Annual Report, 1 Feb. 1984 - 31 Jan. 1985
S. W. Golomb 31 Jan. 1985 7 p
(Contract N00014-84-K-0189)
(AD-A152814; AR-1) Avail: NTIS HC A02/MF A01 CSCL 12/1

A Costas array is an nxn array of dots and blanks with exactly one dot in each row and column, and with distinct vector differences between all pairs of dots. As a frequency-hop pattern for radar or sonar, a Costas array has an optimum ambiguity function, since any translation of the array parallel to the coordinate axes produces at most one out-of-phase coincidence. We conjecture that nxn Costas array exist for every positive integer n. Using various constructions due to L. Welch, A. Lempel, and the authors, Costas arrays are shown to exist when n = p - 1, n = q - 2, n = q - 3, and sometimes when n = q - 4 and n = q - 5, where p is a prime number, and q is any power of a prime number. GRA

N85-28665# North Carolina Univ., Chapel Hill. Center for Stochastic Processes.
ON THE EXCEEDANCE POINT PROCESS FOR A STATIONARY SEQUENCE

T. Hsing and M. R. Leadbetter Jan. 1985 23 p
(Contract F49620-82-C-0009)
(AD-A152827; TR-89; AFOSR-85-0293TR) Avail: NTIS HC A02/MF A01 CSCL 12/1

It is known that the exceedance points of a high level by a stationary sequence are asymptotically Poisson as the level increases, under appropriate long range and local dependence conditions. When the local dependence conditions are relaxed, clustering of exceedances may occur, based on Poisson positions for the clusters. In this paper a detailed analysis of the exceedance point process is given, and show that, under wide conditions, any limiting point process for exceedances is necessarily compound Poisson. Sufficient conditions are also given for the existence of such a limit. The limiting distributions of extreme order statistics are derived as corollaries. GRA

N85-28666# North Carolina Univ., Chapel Hill. Center for Stochastic Processes.
A BILATERALLY DETERMINISTIC rho-MIXING STATIONARY RANDOM SEQUENCE
R. C. Bradley Feb. 1985 17 p
(Contract F49620-82-C-0009)
(AD-A152856; TR-91; AFOSR-85-0348TR) Avail: NTIS HC A02/MF A01 CSCL 12/1

A (non-degenerate) strictly stationary sequence of random variables is constructed such that the P-mixing (maximal correlation mixing) condition is satisfied and each X sub k is measurable with respect to the double-tail signa-field. GRA

N85-28667# Texas A&M Univ., College Station. Dept. of Electrical Engineering.
ALPHABET-CONSTRAINED DATA COMPRESSION Final Report, 1 Oct. 1983 - 30 Nov. 1984
Jerry D. Gibson and Thomas R. Fischer 29 Jan. 1985 232 p refs
(Grant AF-AFOSR-0003-84)
(AD-A152887; AFOSR-85-0289TR) Avail: NTIS HC A11/MF A01 CSCL 12/1

The alphabet-constrained theory of data compression provides a specific methodology for obtaining explicit data compression system designs, which is in sharp contrast with rate distortion theory and the usual intuitional design methods. Various aspects of alphabet-constrained data compression were investigated, including preposterior analysis, adaptive code generators, vector quantization and the relationships among prediction, quantization and stationarity. Simulations of several coder designs for speech and image sources were performed. GRA

N85-28668# North Carolina Univ., Chapel Hill. Dept. of Statistics.
NONSMOOTH ANALYSIS AND FRECHET DIFFERENTIABILITY OF M-FUNCTIONALS
B. R. Clarke (Murdock Univ.) Bolling AFB, Washington, D.C. AFOSR Jun. 1984 27 p
(Contract F49620-82-C-0009)
(AD-A152932; AFOSR-85-0298TR) Avail: NTIS HC A03/MF A01 CSCL 12/1

A necessary requirement for existence of the Frechet derivative is that the defining psi function is uniformly bounded, and this naturally excludes those nonrobust estimators such as the maximum likelihood estimator in normal parametric models. In this paper the methods of nonsmooth analysis, described in the book by F.H. Clarke (1983), are introduced to the theory of statistical expansions, and are used here in the proofs of weak continuity and Frechet differentiability of M-functionals. Subsequently the conditions for Frechet differentiability given in Clarke (1983) can be relaxed to include most popular M-functionals. GRA

N85-28669# North Carolina Univ., Chapel Hill. Dept. of Statistics.
EXTENSION OF THREE THEOREMS OF FOURIER SERIES ON THE DISC TO THE TORUS
A. Miamee Dec. 1984 27 p
(Contract F49620-82-C-0009)
(AD-A153017; TR-84; AFOSR-85-0294TR) Avail: NTIS HC A03/MF A01 CSCL 12/1

The author extends three well-known facts of Fourier series on the disc to Fourier series on the torus, a theorem of Riesz, a theorem of Szego, and the fact that any function in H sub 1 can be factored as the product of two functions in H sub 2. Here the role of negative integers is played by the lattice points in the third quadrant. In earlier extensions of these theorems this role was played by half-planes. GRA

N85-28670# Navy Personnel Research and Development Center, San Diego, Calif.
AN EMPIRICAL COMPARISON OF THE ACCURACY OF UNIVARIATE AND MULTIVARIATE CORRECTIONS FOR RANGE RESTRICTION Technical Report, Oct. 1980 - Oct. 1982
S. Booth-Kewley Feb. 1985 56 p
(AD-A153071; AD-F630700; NPRDC-TR-85-19) Avail: NTIS HC A04/MF A01 CSCL 12/1

A study was conducted to determine whether uncorrected validity coefficients, those corrected for univariate range restriction, or those corrected for multivariate range restriction would be the most accurate in estimating the unrestricted population validity coefficients, and hence the most appropriate for use in Navy personnel section research. Correlations were computed between scores on Armed Services Vocational Aptitude Battery (ASVAB) predictors--ASVAB tests and school selector composites--and student performance scores for seven Navy technical schools with numbers of students ranging from 880 to 2598. These correlations were regarded as true validity coefficients and each school regarded as a population. Restricted samples were selected from each population. Validity coefficients were computed for each restricted; these values were corrected using the multivariate correction procedure. Validity coefficients that were corrected using a univariate and multivariate procedure were generally more accurate than those corrected using univariate procedure, and univariate corrected validity coefficients were more accurate than uncorrected validity coefficients. GRA

N85-28671# Yale Univ., New Haven, Conn. Dept. of Computer Science.
POLYNOMIAL ITERATION FOR NONSYMMETRIC INDEFINITE LINEAR SYSTEMS
H. C. Elman and R. L. Streit Mar. 1985 20 p
(Contract N00014-82-K-0184)
(AD-A153094; Yaleu/DCS/RR-380) Avail: NTIS HC A02/MF A01 CSCL 12/1

We examine iterative methods for solving sparse nonsymmetric indefinite systems of linear equations. Methods considered include a adaptive model based on polynomials that satisfy an optimality condition in the Chebyshev norm, the conjugate gradient-like method GMRES, and the conjugate gradient method applied to the normal equations. Numerical experiments on several non-self-adjoint indefinite elliptic boundary value problems suggest that none of these methods is dramatically superior to the others. Their performance in solving moderately difficult problems is satisfactory, but for harder problems their convergence is slow. GRA

N85-28672# L N K Corp., Inc., Silver Spring, Md.
FURTHER STUDY OF DIGITAL MATCHING OF DISSIMILAR IMAGES Final Technical Report, Jul. 1982 - Sep. 1984
D. Lavine, E. Olson, B. Lambird, C. Berenstein, and D. Leifker Feb. 1985 111 p
(Contract DACA76-82-C-0003)
(AD-A153112; ETL-0385) Avail: NTIS HC A06/MF A01 CSCL 12/1

This report reviews the L.N.K. registration algorithm and provides an example. The matching of radar and optical imagery was investigated. Special processing of the radar imagery was found to be required and an edge-preserving local filter was successfully applied. A foundation was begun for transformation reliability estimation through the concept of point pattern spaces,

as an alternative preferable to least squares. Pattern spaces for translation, rotation, and point reordering were considered. GRA

N85-28673# Pittsburgh Univ., Pa. Center for Multivariate Analysis.
AN INEQUALITY AND ITS APPLICATION TO THE TRUNCATED DISTRIBUTIONS
R. Khattree and Y. Q. Yin Feb. 1985 13 p
(Contract F49620-85-C-0008)
Avail: NTIS HC A02/MF A01 CSCL 12/1

The properties of the truncated distributions for the various families of probability densities have been well discussed in the literature. Also, well known are the expressions for mean, variance and higher order moments of truncated distributions, corresponding to certain families. Johnson and Kotz present an excellent account of these properties almost in every chapter of their four-volume reference work on statistical distributions. This report derives a probability inequality, and then using this inequality, obtain a property of the variance of the subpopulation, obtained by truncating the superpopulation between two points for a certain family of density function bearing some mild conditions. The variance of the univariate truncated distribution increases with the value of the truncation point. GRA

N85-28674# Pittsburgh Univ., Pa. Center for Multivariate Analysis.
ROBUST TESTS OF MEAN VECTOR IN SYMMETRICAL MULTIVARIATE DISTRIBUTIONS
N. Giri and B. K. Sinha Jan. 1985 20 p
(Contract F49620-85-C-0008)
(AD-A153116; TR-85-01; AFOSR-85-0337TR) Avail: NTIS HC A02/MF A01 CSCL 12/1

This document discusses probability density functions, lorally minimax tests, and matrices (mathematics). GRA

N85-28675# IBM Watson Research Center, Yorktown Heights, N.Y.
NUMERICAL METHODS FOR STIFF ORDINARY AND ELLIPTIC PARTIAL DIFFERENTIAL EQUATIONS Final Report, 1 Oct. 1982 - 31 Jan. 1985
L. Werner and F. Odeh Feb. 1985 6 p
(Contract F49620-83-C-0005)
(AD-A153247; AFOSR-85-0336TR) Avail: NTIS HC A02/MF A01 CSCL 12/1

The research under this effort was concerned with stable high-order methods for nonlinear stiff systems of ordinary differential equations, relaxation methods for large scale circuit analysis, and fast direct methods for elliptic partial differential equations on general regions. More specifically, the convergence of the discretized version of the wave-form relaxation algorithm was shown under suitable assumptions on the stability of the multistep methods employed and on the strength of the feedback. A new large-scale circuit decomposition was shown to be effective for a large class of digital circuits. In the area of fast direct methods for elliptic partial differential equations, a one parameter family of factored discretizations of the Laplace operator was derived. A variant of the marching method was proposed which is much more stable than the conventional approach and is thus applicable to grids with large numbers of discretization steps in each direction. GRA

N85-28676# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
SCALAR MODAL CONTROL OF A NONLINEAR SYSTEM USING TIME VARYING GAIN M.S. Thesis
R. Nici Dec. 1984 55 p
(AD-A153252; AFIT/GA/AA/84D-8) Avail: NTIS HC A04/MF A01 CSCL 12/1

A nonlinear system inhibited some relationship between system stability and controller off-time. An increase in the off-time of the controller from 6.5% to 78.0% resulted in the nonlinear system maintaining stability over 50 time periods. A nonlinear system was controlled using feedback based on the unstable system parameters. The Henon and Heiles model was used to provide an unstable periodic orbit. The linearized equations of motion, using Floquet Theory, were developed into variational equations. A controller was derived based on a system characteristic: the controllability matrix. Together with the nonlinear system the controller was integrated for many time periods using zero initial displacement. Stability was achieved for about 50 time periods of the zero displacement conditions. GRA

N85-28677# Yale Univ., New Haven, Conn. Dept. of Statistics.
ROBUST REGRESSION THROUGH ROBUST COVARIANCES
S. Morgenthaler and R. Maronna Jan. 1985 30 p
(Contract DAAG29-84-K-0207)
(AD-A153301; TR-2-ARO; ARO-21779.2-MA) Avail: NTIS HC A03/MF A01 CSCL 12/1

This paper describes a regression estimator which builds on the investigation of the covariance structure in the full space of explanatory variables and response variable. It is robust since it down weights outlying observations. A comparison to other robust estimators is included. GRA

N85-28678# Los Alamos Scientific Lab., N. Mex.
PROJECTED DISCRETE ORDINATES METHODS FOR NUMERICAL TRANSPORT PROBLEMS
E. W. Larsen 1985 14 p refs Presented at Intern. Meeting on Advan. in Nucl. Eng. Computational Methods, Knoxville, Tenn., 9 Apr. 1985
(Contract W-7405-eng-36)
(DE85-005632; LA-UR-84-3928) Avail: NTIS HC A02/MF A01

A class of projected discrete-ordinates (PDO) methods is described for obtaining iterative solutions of discrete-ordinates problems with convergence rates comparable to those observed using diffusion synthetic acceleration (DSA). The spatially discretized PDO solutions are generally not equal to the DSA solutions, but unlike DSA, which requires great care in the use of spatial discretizations to preserve stability, the PDO solutions remain stable and rapidly convergent with essentially arbitrary spatial discretizations. Numerical results are presented which illustrate the rapid convergence and the accuracy of solutions obtained using PDO methods with commonplace differencing methods. DOE

N85-28679# Los Alamos Scientific Lab., N. Mex.
AUGMENTED WEIGHTED DIAMOND FORCE OF THE LINEAR NODAL SCHEME FOR CARTESIAN COORDINATE SYSTEMS
W. F. Walters 1985 10 p refs Presented at Intern. Meeting on Advan. in Nucl. Eng. Computational Methods, Knoxville, Tenn., 9 Apr. 1985
(DE85-005631; LA-UR-84-3927; CONF-850411-3) Avail: NTIS HC A03/MF A01

The equations of the high order linear nodal numerical scheme are cast in an augmented weighted difference form for three-dimensional Cartesian nodes. The coupling exhibited by these equations indicate that this new algorithm is simpler and hence faster than previous nodal schemes of this degree of accuracy. A well-logging problem and a fast reactor problem are examined. The new scheme and the diamond difference scheme are included. For the well-logging problem, it is found that the new scheme is both faster and simpler than the classical linear-linear nodal scheme while sacrificing little in accuracy. Even though the new scheme is more accurate than the diamond difference scheme for the reactor problem, the results indicate that state of the art acceleration methods are needed for nodal schemes. DOE

N85-28680# Los Alamos Scientific Lab., N. Mex. Theoretical Div.
MODERN TEST OF CHIRAL ANOMALIES
G. Kramer (Hamburg Univ.), William F. Palmer (Ohio State Univ., Columbus), and Stephen S. Pinsky (Ohio State Univ., Columbus) 1984 8 p refs Presented at the Am. Phys. Soc. Meeting, Santa Fe, N. Mex., 31 Oct. - 3 Nov. 1984 Submitted for publication
(Contract W-7405-eng-36)
(DE85-005892; LA-UR-85-151; CONF-8410222-12) Avail: NTIS HC A02/MF A01

Chiral anomalies are calculated using an effective Lagrangian technique introduced for anomalies by Wess and Zumino and recently reformulated by Witten. Anomalous amplitudes for vector currents decaying into three pseudoscalars are tested by comparison with K/sub 14/ decay and eta (YIELDS) (PI) (+) (PI) (-) (GAMMA). DOE

N85-28681# Oak Ridge National Lab., Tenn.
SYMBOLIC GIVENS REDUCTION IN LARGE SPARSE LEAST SQUARES PROBLEMS
George Ostrouchov Dec. 1984 48 p refs
(Contract DE-AC05-84OR-21400)
(DE85-008685; ORNL-6102) Avail: NTIS HC A03/MF A01

Orthogonal Givens factorization is a method for solving large sparse least squares problems. A preliminary symbolic factorization needs to exploit sparsity and to use a fixed data structure in Givens reduction. Some results on row ordering and structure of rows in a partially reduced matrix are obtained using a graph theoretic representation. These results provide a basis for a symbolic Givens factorization. Column is discussed, and an algorithm for symbolic Givens reduction is tested. DOE

N85-28682# Oak Ridge National Lab., Tenn.
PARALLEL CHOLESKY FACTORIZATION ON A MULTIPROCESSOR
A. George, M. T. Heath, and J. Liu Mar. 1985 25 p refs
(Contract DE-AC05-84OR-21400)
(DE85-008762; ORNL-6124) Avail: NTIS HC A03/MF A01

A parallel algorithm is developed for Cholesky factorization on a multiprocessor. The algorithm is based on self scheduling of a pool of tasks. The subtasks in several variants of the basic elimination algorithm are analyzed for potential concurrency in terms of precedence relations, work profiles, and processor utilization. This analysis is supported by simulation results. The most promising variant, which we call column-Cholesky, is identified and implemented for the Denelcor HEP multiprocessor. Experimental results are given for this machine. DOE

N85-28683# California Univ., Livermore. Lawrence Livermore Lab.
MONTONICITY PRESERVING BICUBIC INTERPOLATION, REVISION 1
F. N. Fritsch and R. E. Carlson Feb. 1985 11 p refs Presented at the 2nd Intern. Symp. on Surfaces in Computer Aided Geometric Design, Oberwolfach, West Germany, 11 Nov. 1984
(Contract W-7405-eng-48)
(DE85-007976; UCRL-91788-Rev-1; Conf-8411129-1-Rev-1) Avail: NTIS HC A02/MF A01

A new algorithm for piecewise biocubic interpolation to bivariate data on a rectangular mesh is described. The Hermite form is used to represent the resulting surface. The Hermite derivatives are determined by a five step procedure that guarantees a monotonic interpolant to monotonic data. DOE

N85-28684# Los Alamos Scientific Lab., N. Mex.
SPATIAL DIFFERENCING FOR FINITE DIFFERENCE CODES
L. G. Margolin and Thomas F. Adams Jan. 1985 24 p refs
(Contract W-7405-eng-36)
(DE85-008902; LA-10249) Avail: NTIS HC A02/MF A01

New expressions for the approximation of the spatial gradients of velocity are derived for use in finite difference programs for solid and fluid dynamics. Analytically, the change of volume of a finite body can be determined from the velocity on the surface of the body. The expressions are found essentially by enforcing this relation on the difference approximations. For problems with cylindrical symmetry, the new forms are substantially different than any previously seen. The advantages of the new forms are demonstrated in a sample calculation. DOE

N85-28685# Alabama Univ., Birmingham. Dept. of Mathematics.
FUZZY HIERARCHICAL ANALYSIS
J. J. Buckley and V. R. R. Uppuluri (ORNL) 1984 30 p refs Presented at the Society for Risk Analysis Ann. Meeting, Knoxville, Tenn., 30 Sep. 1984
(Contract DE-AC05-84OR-21400)
(DE85-008149; CONF-8409169-4) Avail: NTIS HC A03/MF A01

Hierarchical analysis is extended to the case where the participants are allowed to employ fuzzy ratios in place of exact ratios. If a person considers Alternative A more important than Alternative B, then the ratio used might be approximately 3 to 1, or between 2 to 1 and 4 to 1, or at most 5 to 1. The pairwise comparison of the issues and the criteria in the hierarchy produce fuzzy positive reciprocal matrices. The geometric mean method is employed to calculate the fuzzy weights for each fuzzy matrix, and these are combined in the usual manner to determine the final fuzzy weights for the alternatives. The final fuzzy weights are used to rank the alternatives from highest to lowest. The highest ranking contains all the undominated issues. The procedure easily extends to the situation where many experts are utilized in the ranking process. Two examples are presented showing the final fuzzy weights and the final ranking. DOE

N85-28686# Technische Hogeschool, Delft (Netherlands). Dept. of Mathematics and Informatics.
A FAST IMPLEMENTATION OF EXPLICIT TIME STEPPING ALGORITHMS WITH THE FINITE ELEMENT METHOD FOR A CLASS OF NONLINEAR EVOLUTION PROBLEMS
A. Segal and N. Praagman (Coastal and Harbor Engineering Consultants) 1984 28 p refs
(Rept-84-03) Avail: NTIS HC A03/MF A01

It is shown that, under special conditions, the application of the product approximation variation of the Galerkin method for nonlinear evolution problems in the finite element method results in constant (i.e., time independent) matrices. Computing required to solve these equations with an explicit time-stepping algorithm is decreased considerably compared to the standard Galerkin formulation in which the matrices are time dependent. The method is applied to the shallow water equations and a nonlinear heat conduction problem. Author (ESA)

N85-28687# Technische Hogeschool, Delft (Netherlands). Dept. of Mathematics and Informatics.
RELAXATION METHODS FOR HYPERBOLIC EQUATIONS
Bram vanLeer and William A. Mulder (Leiden Univ.) 1984 36 p refs Presented at INRIA Workshop on Numer. Methods for the Euler Equations for Compressible Fluids, Le Chesnay, France, 7-9 Dec. 1983
(Rept-84-20) Avail: NTIS HC A03/MF A01

A class of unconditionally stable integration schemes for finding steady solutions to the time dependent Euler equations is discussed. The schemes are time accurate for small time steps and turn into a relaxation method for large time steps; the spatial discretization is upwind biased. Examples of these switched evolution/relaxation (SER) schemes, and a numerical comparison, are presented. Standard alternating direction implicit and approximate factorization methods which do not belong to the SER family are considered. Author (ESA)

N85-28688# Technische Hogeschool, Delft (Netherlands). Dept. of Mathematics and Informatics.
A NOTE ON INTEGRAL OPERATORS
Ben dePagter 1983 10 p refs
(Rept-83-26) Avail: NTIS HC A02/MF A01

It is proved that Buhvalov's result, that the set of all absolute integral operators from an ideal L into an ideal M of measurable functions is equal to the band generated by the integral operators of finite rank, remains valid without the assumption that the normal integrals on the domain L separate the points (which guarantees the existence of sufficiently many nonzero integral operators). It is shown that if L is an ideal of measurable functions not possessing any nonzero normal integrals, then L cannot be the domain of any nonzero integral operator. Author (ESA)

N85-28689# Technische Hogeschool, Delft (Netherlands). Dept. of Mathematics and Informatics.

ASYMPTOTIC EXPANSION OF JACOBI POLYNOMIALS
H. G. Meijer 1984 13 p refs
(Rept-84-35) Avail: NTIS HC A02/MF A01

Asymptotic expansion of Jacobi polynomials by estimation of integral representation of a Koorwinder formula, is given. The saddle point method is applied to paths of steepest descent. Gegenbauer polynomials and Legendre polynomials are related by functional equations of Jacobi polynomials. Author (ESA)

N85-28690# Technische Hogeschool, Delft (Netherlands). Dept. of Mathematics and Informatics.
ON THE ACCURACY OF THE POINCARE-LINDSTEDT METHOD
A. H. P. vanderBurgh 1984 24 p refs
(Rept-84-37) Avail: NTIS HC A02/MF A01

The truncation of the power series of the dependent and independent variables of the Poincare-Lindstedt method for the construction of approximations to a periodic solution of a class of second order nonlinear differential equations is considered. A classification which shows on what time-intervals the periodic solution and its approximation are in phase is derived. It can used for the calculation of the position of satellites or planets. The example used by Einstein to predict the perihelium precession of Mercury is considered. The initial value problem for the Einstein equation has a period T which may have all values in T between 2 pi and infinity. How to calculate approximations to a periodic solution in the neighborhood of the saddle point by a perturbative procedure is unresolved. Author (ESA)

N85-28691# Technische Hogeschool, Delft (Netherlands). Dept. of Mathematics and Informatics.
FOURIER CODING AND RECONSTRUCTION OF COMPLICATED CONTOURS
F. M. Dekking and P. J. vanOtterloo (Philips Research Labs., Eindhoven, Netherlands) 1984 25 p refs
(Rept-84-39) Avail: NTIS HC A02/MF A01

Coding of simple polygonal two dimensional contours by a finite number of their Fourier coefficients and reconstruction by the corresponding Fourier sums is studied. Sequences of closed contours displaying increasing levels of detail are introduced. It is shown that the Fourier coefficients of the (normalized arclength) parameterizations of such contours do not have a specific rate of convergence. Although the derived general bound for the deviation between a contour and its partial Fourier series approximation is tighter than the one employed in the literature, very many Fourier coefficients in relation to the number of sides to obtain a given level of accuracy are needed. Given the regularity of the examples, the mechanism of Fourier coding and reconstruction is unfit for the general case of shape description of shapes whose contours exhibit much detail. Author (ESA)

N85-28692# Center for Mathematics and Computer Science, Amsterdam (Netherlands). Dept. of Applied Mathematics.
A CONVOLUTION INTEGRAL EQUATION SOLVED BY LAPLACE TRANSFORMATION
N. M. Temme Jun. 1984 8 p refs Submitted for publication
(CWI-AM-R8409; B8478806) Avail: NTIS HC A02/MF A01

Expansion of infinity of solutions of an integral equation considered in a statistical problem (Groenboon Problem) on the estimation of monotone densities is discussed. Analytic continuation of solution of this integral equation is shown. The construction of the explicit solution is given. Author (ESA)

N85-28693# Center for Mathematics and Computer Science, Amsterdam (Netherlands). Dept. of Applied Mathematics.
A CLASS OF POLYNOMIALS RELATED TO THOSE OF LAGUERRE
N. M. Temme Oct. 1984 10 p refs Submitted for publication
(CWI-AM-R8411; B8478811) Avail: NTIS HC A02/MF A01

Sequence alternate (Tricomi polynomials) of Laguerre polynomials are considered. Properties of uniform expansion of Laplace-type integral and Tricomi polynomials are reported. Asymptotic expansion of Tricomi polynomials is given. This expansion refines Tricomi-Berg's results. Author (ESA)

N85-28694# Center for Mathematics and Computer Science, Amsterdam (Netherlands). Dept. of Applied Mathematics.
UNIFORM ASYMPTOTIC EXPANSIONS OF INTEGRALS
N. M. Temme Oct. 1984 17 p refs Submitted for publication
(CWI-AM-R8412; B8478810) Avail: NTIS HC A02/MF A01

The steps of uniform asymptotic expansion of integrals on a contour in the complex plane and dependent on two parameters are discussed. This method is applied in optics and scattering theory and higher transcendental function theory. The computational problems for these generalizations are not easy to solve. Uniformity problems in theory of unfolding of singularites are not considered. Author (ESA)

N85-28695# Center for Mathematics and Computer Science, Amsterdam (Netherlands). Dept. of Applied Mathematics.
DYNAMICAL SYSTEMS AND NUMERICAL INTEGRATION
H. A. Lauwerier Oct. 1984 29 p refs Submitted for publication
(CWI-AM-R8413; B8478813) Avail: NTIS HC A03/MF A01

Discrete dynamical systems applied to numerical integration of ordinary differential equations (ODE) are considered. Poincare-Birkhoff theorem and Kolmogorov-Moser theorem as chaotic oscillations are reported. Schemes for numerical integration of ODE are of wider generality than Taylor expansion methods. Author (ESA)

N85-28696# Center for Mathematics and Computer Science, Amsterdam (Netherlands). Dept. of Numerical Mathematics.
ON THE ALGEBRAIC EQUATIONS IN IMPLICIT RUNGE-KUTTA METHODS
W. H. Hundsdorfer and M. N. Spijker (Leiden University) Oct. 1984 17 p refs Submitted for publication
(CWI-NM-R8413; B8478815) Avail: NTIS HC A02/MF A01

The system of (nonlinear) algebraic equations which arise in the application of implicit Runge-Kutta methods to stiff initial value problems is discussed. Without making the classical assumption that the stepsize $h<0$ is small, transparent conditions on the method that guarantee existence and uniqueness of solutions to the equations are derived. The sensitivity of the Runge-Kuttta procedure to perturbations in the algebraic equations is considered. Author (ESA)

N85-28697# Center for Mathematics and Computer Science, Amsterdam (Netherlands). Dept. of Numerical Mathematics.
A PROGRAM FOR SOLVING FIRST KIND FREDHOLM INTEGRAL EQUATIONS BY MEANS OF REGULARIZATION
H. J. J. teRiele Nov. 1984 21 p refs Submitted for publication
(CWI-NM-R8416; B8561786) Avail: NTIS HC A02/MF A01

A program for solving a Fredholm integral equation of the first kind with the regularization method of Philipps and Tihonov is described. The program is useful in the mathematical analysis of physical problems such as elastic electron-atom scattering. The program runs on a CDC Cyber 175-750, in FORTRAN 77. Author (ESA)

N85-28698# Center for Mathematics and Computer Science, Amsterdam (Netherlands). Dept. of Numerical Mathematics.
SYMMETRIC LINEAR MULTISTEP METHODS FOR SECOND-ORDER DIFFERENTIAL EQUATIONS WITH PERIODIC SOLUTIONS
B. P. Sommeijer, P. J. vanderHouwen, and B. Neta (Naval Postgraduate School, Monterey, California) Jan. 1985 12 p refs Submitted for publication
(CWI-NM-R8501; B8561785) Avail: NTIS HC A02/MF A01

Linear multistep methods (LM) for second-order differential equations (DE) are considered. Symmetric LM are applied to DE without first derivatives. The methods can be tuned to user knowledge on the location of the frequencies for exact solutions of DE. Numerical results are compared with symmetric methods of Lambert-Watson and Gautschi's method. Author (ESA)

N85-28564*# Brunel Univ., Uxbridge (England).
SHAPE PRESERVING SPLINE INTERPOLATION Abstract Only
John A. Gregory *In* NASA. Langley Research Center Computational Geometry and Computer-Aided Design Jun. 1985 p 1-8 refs (For primary document see N85-28563 17-59)
Avail: NTIS HC A06/MF A01 CSCL 12A

N85-28565*# Boeing Computer Services Co., Seattle, Wash.
THE CONSTRUCTION OF CURVES AND SURFACES USING NUMERICAL OPTIMIZATION TECHNIQUES Abstract Only
David R. Ferguson *In* NASA. Langley Research Center Computational Geometry and Computer-Aided Design Jun. 1985 p 9-14 refs (For primary document see N85-28563 17-59)
Avail: NTIS HC A06/MF A01 CSCL 12A

N85-28566*# Technische Univ., Brunswick (West Germany). Angewandte Geometrie und GDV.
MULTIVARIATE SPLINE ALGORITHMS FOR CAGD Abstract Only
Wolfgang Boehm *In* NASA. Langley Research Center Computational Geometry and Computer-Aided Design Jun. 1985 p 15-20 refs (For primary document see N85-28563 17-59)
Avail: NTIS HC A06/MF A01 CSCL 12A

N85-28567*# Utah Univ., Salt Lake City. Dept. of Mathematics.
A SURVEY OF PATCH METHODS Abstract Only
R. E. Barnhill *In* NASA. Langley Research Center Computational Geometry and Computer-Aided Design Jun. 1985 p 21-28 refs (For primary document see N85-28563 17-59)
Avail: NTIS HC A06/MF A01 CSCL 12A

N85-28568*# Rensselaer Polytechnic Inst., Troy, N. Y.
WHEN IS A BERNSTEIN-BEZIER CURVE THE GRAPH OF A FUNCTION? Abstract Only
Harry W. McLaughlin *In* NASA. Langley Research Center Computational Geometry and Computer-Aided Design Jun. 1985 p 29-30 (For primary document see N85-28563 17-59)
Avail: NTIS HC A06/MF A01 CSCL 12A

N85-28569*# Cranfield Inst. of Tech., Bedford (England).
FREE-FORM DESIGN IN SOLID MODELLING
M. J. Pratt *In* NASA. Langley Research Center Computational Geometry and Computer-Aided Design Jun. 1985 p 31-34 refs (For primary document see N85-28563 17-59)
Avail: NTIS HC A06/MF A01 CSCL 12A

N85-28570*# Sandia Labs., Albuquerque, N. Mex. CAD Technology Div.
BOUNDARY TO CONSTRUCTIVE SOLID GEOMETRY MAPPINGS: A FOCUS ON 2-D ISSUES Abstract Only
Donald P. Peterson *In* NASA. Langley Research Center Computational Geometry and Computer-Aided Design Jun. 1985 p 35-36 (For primary document see N85-28563 17-59)
(Contract DE-AC04-76DP-00078)
Avail: NTIS HC A06/MF A01 CSCL 12A

N85-28571*# Allied Bendix Aerospace, Kansas City, Mo.
THE DEFINITION AND COMPUTATION OF A METRIC ON PLANE CURVES. THE MEANING OF A FACE ON A GEOMETRIC MODEL
James D. Emery *In* NASA. Langley Research Center Computational Geometry and Computer-Aided Design Jun. 1985 p 37-44 refs (For primary document see N85-28563 17-59)
Avail: NTIS HC A06/MF A01 CSCL 12A

N85-28572*# Finite Element Graphics Systems Ltd., Cambridge (England).
SOME NEGATIVE RESULTS IN N-SIDED PATCHES Abstract Only
Malcolmb Sabin *In* NASA. Langley Research Center Computational Geometry and Computer-Aided Design Jun. 1985 p 45 refs (For primary document see N85-28563 17-59)
Avail: NTIS HC A06/MF A01 CSCL 12A

N85-28573*# Los Alamos Scientific Lab., N. Mex.
EXAMINATION OF THE CIRCLE SPLINE ROUTINE Abstract Only
Ronald M. Dolin and Dwight L. Jaeger *In* NASA. Langley Research Center Computational Geometry and Computer-Aided Design Jun. 1985 p 47-49 (For primary document see N85-28563 17-59)
Avail: NTIS HC A06/MF A01 CSCL 12A

N85-28574*# University of Southern Illinois, Carbondale. Dept. of Mathematics.
CONVEX INTERPOLATING SPLINES OF ARBITRARY DEGREE Abstract Only
Edward Neuman (Wroclaw Univ.) *In* NASA. Langley Research Center Computational Geometry and Computer-Aided Design Jun. 1985 p 51-54 (For primary document see N85-28563 17-59)
Avail: NTIS HC A06/MF A01 CSCL 12A

N85-28575*# North Carolina State Univ., Raleigh.
A NATURAL BIAS APPROACH TO CARDINAL SPLINE CURVES Abstract Only
G. Yates Fletcher and David F. McAllister *In* NASA. Langley Research Center Computational Geometry and Computer-Aided Design Jun. 1985 p 55-58 refs (For primary document see N85-28563 17-59)
(Grant NAG1-103)
Avail: NTIS HC A06/MF A01 CSCL 12A

N85-28576*# Purdue Univ., Lafayette, Ind. Computer Aided Design Lab.
ADAPTING SHAPE PARAMETERS FOR CUBIC BEZIER CURVES
David Isacoff and Michael J. Bailey *In* NASA. Langley Research Center Computational Geometry and Computer-Aided Design Jun. 1985 p 59-64 refs Sponsored by Control Data Corp. (For primary document see N85-28563 17-59)
Avail: NTIS HC A06/MF A01 CSCL 12A

N85-28577*# Utah Univ., Salt Lake City. Dept. of Mathematics.
TRIANGULAR BERSTEIN-BEZIER PATCHES, A SURVEY AND NEW RESULTS Abstract Only
Gerald Farin *In* NASA. Langley Research Center Computational Geometry and Computer-Aided Design Jun. 1985 p 65-66 refs (For primary document see N85-28563 17-59)
Avail: NTIS HC A06/MF A01 CSCL 12A

N85-28578*# California Univ., Davis. Dept. of Electrical and Computer Engineering.
A UNIFORM SUBDIVISION METHOD FOR TRIANGULAR BEZIER PATCHES
Kenneth I. Joy *In* NASA. Langley Research Center Computational Geometry and Computer-Aided Design Jun. 1985 p 67-70 refs (For primary document see N85-28563 17-59)
Avail: NTIS HC A06/MF A01 CSCL 12A

N85-28579*# California Univ., Berkeley. Computer Graphics Lab.
AN INTUITIVE APPROACH TO GEOMETRIC CONTINUITY FOR PARAMETRIC CURVES AND SURFACES (EXTENDED ABSTRACT) Abstract Only
Tony D. DeRose and Brian A. Barsky *In* NASA. Langley Research Center Computational Geometry and Computer-Aided Design Jun. 1985 p 71-76 refs Sponsored in cooperation with the State of California and Shell Doctoral Fellowship (For primary document see N85-28563 17-59)
(Contract N00039-82-C-0235; Grant NSF ECS-82-04381)
Avail: NTIS HC A06/MF A01 CSCL 12A

N85-28580*# Control Data Corp., Minneapolis, Minn.
URN MODELS AND BETA-SPLINES
R. N. Goldman *In* NASA. Langley Research Center Computational Geometry and Computer-Aided Design Jun. 1985 p 77-82 refs (For primary document see N85-28563 17-59)
Avail: NTIS HC A06/MF A01 CSCL 12A

N85-28581*# Mississippi State Univ., Mississippi State.
PARAMETERIZATION IN GRID GENERATION
C. Wayne Mastin *In* NASA. Langley Research Center Computational Geometry and Computer-Aided Design Jun. 1985 p 83-86 ref (For primary document see N85-28563 17-59)
(Grant NsG-1577)
Avail: NTIS HC A06/MF A01 CSCL 12A

N85-28582*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
CONTOURING TRIVARIATE DATA
Sarah E. Stead and George T. Makatura (Informatics General Corp., Palo Alto, Calif.) *In* NASA. Langley Research Center Computational Geometry and Computer-Aided Design Jun. 1985 p 87-90 refs (For primary document see N85-28563 17-59)
Avail: NTIS HC A06/MF A01 CSCL 12A

N85-28583*# Mississippi State Univ., Mississippi State. Dept. of Aerospace Engineering.
GENERATION OF SURFACE COORDINATES BY ELLIPTIC PARTIAL DIFFERENTIAL EQUATIONS
Z. U. A. Warsi *In* NASA. Langley Research Center Computational Geometry and Computer-Aided Design Jun. 1985 p 91-94 refs Sponsored by AFOSR (For primary document see N85-28563 17-59)
Avail: NTIS HC A06/MF A01 CSCL 12A

N85-28584*# Mississippi State Univ., Mississippi State. Dept. of Aerospace Engineering.
A SURVEY OF COMPOSITE GRID GENERATION FOR GENERAL THREE-DIMENSIONAL SECTIONS
Joe F. Thompson *In* NASA. Langley Research Center Computational Geometry and Computer-Aided Design Jun. 1985 p 95-97 refs (For primary document see N85-28563 17-59)
Avail: NTIS HC A06/MF A01 CSCL 12A

N85-28585*# Virginia Univ., Charlottesville. Dept. of Computer Science.
A UNIFIED REPRESENTATION SCHEME FOR SOLID GEOMETRIC OBJECTS USING B-SPLINES (EXTENDED ABSTRACT) Abstract Only
Dennis Bahler *In* NASA. Langley Research Center Computational Geometry and Computer-Aided Design Jun. 1985 p 99-104 refs (For primary document see N85-28563 17-59)
(Grants NAG5-28209; NSF MCS-83-02654)
Avail: NTIS HC A06/MF A01 CSCL 12A

N85-28586*# Ford Motor Co., Dearborn, Mich. Computer-Aided Engineering Dept.
IMPROVING THE EFFECTIVENESS OF INTEGRAL PROPERTY CALCULATION IN A CSG SOLID MODELING SYSTEM BY EXPLOITING PREDICTABILITY
Alan L. Clark *In* NASA. Langley Research Center Computational Geometry and Computer-Aided Design Jun. 1985 p 105-108 (For primary document see N85-28563 17-59)
Avail: NTIS HC A06/MF A01 CSCL 12A

N85-28587*# New Orleans Univ., La.
SPLINE CURVES, WIRE FRAMES AND B-VALUE
Leigh Smith and Frederick Munchmeyer *In* NASA. Langley Research Center Computational Geometry and Computer-Aided Design Jun. 1985 p 109-112 refs (For primary document see N85-28563 17-59)
Avail: NTIS HC A06/MF A01 CSCL 12A

N85-28588*# Dundee Univ. (Scotland). Dept. of Anatomy.
NUMERICAL ESTIMATION OF THE CURVATURE OF BIOLOGICAL SURFACES Abstract Only
P. H. Todd *In* NASA. Langley Research Center Computational Geometry and Computer-Aided Design Jun. 1985 p 113-115 (For primary document see N85-28563 17-59)
Avail: NTIS HC A06/MF A01 CSCL 12A

N85-28589*# CADLINC, Inc., Troy, Mich.
A NEW TECHNIQUE FOR SYSTEM-TO-SYSTEM TRANSFER OF SURFACE DATA Abstract Only
Michael W. Sterling, Michael E. Lucius, and William J. Gordon (Drexel Univ., Philadelphia, Pa.) *In* NASA. Langley Research Center Computational Geometry and Computer-Aided Design Jun. 1985 p 117-118 (For primary document see N85-28563 17-59)
Avail: NTIS HC A06/MF A01 CSCL 12A

N85-28590*# National Research Inst. for Mathematical Sciences, Pretoria (South Africa).
CURVED FINITE ELEMENTS AND CURVE APPROXIMATION
M. Louisa Baart *In* NASA. Langley Research Center Computational Geometry and Computer-Aided Design Jun. 1985 p 119-112 refs (For primary document see N85-28563 17-59)
Avail: NTIS HC A06/MF A01 CSCL 12A

N85-28591*# Structural Dynamics Research Corp., Milford, Ohio.
COMPARISON OF TWO ALGEBRAIC METHODS FOR CURVE/CURVE INTERSECTION
Yves deMontaudouin and Wayne Tiller *In* NASA. Langley Research Center Computational Geometry and Computer-Aided Design Jun. 1985 p 123-125 refs (For primary document see N85-28563 17-59)
Avail: NTIS HC A06/MF A01 CSCL 12A

N85-28592*# Brigham Young Univ., Provo, Utah.
A COMPARISON OF THREE CURVE INTERSECTION ALGORITHMS Abstract Only
Thomas W. Sederberg and Scott R. Parry *In* NAA. Langley Research Center Computational Geometry and Computer-Aided Design Jun. 1985 p 127-128 refs (For primary document see N85-28563 17-59)
Avail: NTIS HC A06/MF A01 CSCL 12A

65 STATISTICS AND PROBABILITY

Includes data sampling and smoothing; Monte Carlo method; and stochastic processes.

N85-28699# Maryland Univ., College Park. Dept. of Management Sciences and Statistics.
EFFECTS OF INSPECTION ERRORS ON CURTAILED DORFMAN-TYPE PROCEDURES
S. Kotz, M. Shisong, and N. L. Johnson Mar. 1985 11 p
(Contract N00014-84-K-0301)
(AD-A152376; AD-E900434; UMD-DMSS-85-4) Avail: NTIS HC A02/MF A01 CSCL 12/1

The effects of inspection error on a two-stage procedure for identification of defective units is studied. The first stage is intended to provide the number of defective units in a group of n units; the second stage consists of individual inspection until the status of all units is (apparently) established. Keywords include: Attribute inspection, Binomial distribution, Hypergeometric distribution, Mixtures, and Sequential methods. GRA

N85-28700# Maryland Univ., College Park. Dept. of Management Sciences and Statistics.
STATISTICAL EFFECTS OF IMPERFECT INSPECTION SAMPLING. PART 2: DOUBLE SAMPLING, LINK SAMPLING AND GRADING Final Technical Report
N. L. Johnson, S. Kotz, and R. N. Rodriguez Mar. 1985 11 p
(Contract N00014-84-K-0301)
(AD-A152377; AD-E900434; UMD-DMSS-85-5) Avail: NTIS HC A02/MF A01 CSCL 12/1

This paper, the second in a series of three, utilizes the basic distributions established in the first paper to assure the effect of inspection errors in double sampling, link and partial link sampling and in grading acceptance procedures. Originator-supplied keywords include: Acceptance sampling plans, Binomial distribution, Compound distribution, Double sampling, Link sampling, Hypergeometric distr., and Inspection error tables. GRA

N85-28701# Pennsylvania State Univ., University Park. Dept. of Statistics.
CONFIDENCE INTERVALS BASED ON INTERPOLATED ORDER STATISTICS
T. P. Hettmansperger and S. J. Sheather Mar. 1985 17 p
(Contract N00014-80-C-0741)
(AD-A152607; TR-53) Avail: NTIS HC A02/MF A01 CSCL 12/1

Confidence intervals for the population median based on interpolating adjacent order statistics are presented. They are shown to depend only slightly on the underlying distribution. A simple, nonlinear interpolation formula is given which works well for a broad collection of underlying distributions. Author (GRA)

N85-28702# North Carolina Univ., Chapel Hill. Center for Stochastic Processes.
ESTIMATING RANDOM INTEGRALS FROM NOISY OBSERVATIONS: SAMPLING DESIGNS AND THEIR PERFORMANCE
James A. Bucklew and Stamatis Cambanis Dec. 1984 53 p refs Prepared in cooperation with Wisconsin Univ., Madison
(Contract F49620-82-C-0009)
(AD-A152926; TR-86; AFOSR-85-0297TR) Avail: NTIS HC A04/MF A01 CSCL 12/1

The problem of estimating a weighted average of a random process from noisy observations at a finite number of sampling points is considered. The performance of sampling decisions with optimal or suboptimal, but easily computable, estimator coefficients is studied. Several examples and special cases are studied including additive independent noise, nonlinear distortion with noise, and quantization noise. GRA

N85-28703# North Carolina Univ., Chapel Hill. Center for Stochastic Processes.
ON STOCHASTIC INTEGRAL REPRESENTATION OF STABLE PROCESSES WITH SAMPLE PATHS IN BANACH SPACES
Jan Rosinski Jan. 1985 40 p refs
(Contract F49620-82-C-0009)
(AD-A152927; TR-88; AFOSR-85-0296TR) Avail: NTIS HC A03/MF A01 CSCL 12/1

Certain path properties of a symmetric a-stable process are studied in terms of the kernel h. The existence of an appropriate modification of the kernel h enables one to use results from stable measures on Banach spaces in studying of X. Bounds for the moments of the norm of sample paths of X are obtained. This yields definite bounds for the moments of a double alpha-stable integral. Also necessary and sufficient conditions for the absolute continuity of sample paths of X are given. Along with the above stochastic integral representation of stable processes, the representation of stable random vectors due to LePage, Woodrooffe and Zinn is extensively used and the relationship between these two representations is discussed. GRA

N85-28704# Stanford Univ., Calif. Dept. of Statistics.
A COLLECTION OF PROBABILITY DISTRIBUTIONS
C. S. Davis and M. A. Stephens 27 Feb. 1985 35 p
(Contract N00014-76-C-0475)
(AD-A153128; SU-TR-353) Avail: NTIS HC A03/MF A01 CSCL 12/1

A large number of probability distributions, with at least the first 4 moments known and methods of obtaining cumulative distribution functions or percentage points available, is presented. They do not include the common statistical distributions, such as the normal, chi-squared, t, F, gamma, beta and Johnson distributions. There are 395 distributions, from 20 different families; the parameters were chosen to cover a large area of the plane. The purpose of making the collection was to use the distributions to assess the accuracy of various methods of approximating densities, and they should be useful in similar studies. GRA

N85-28705# North Carolina Univ., Chapel Hill. Center for Stochastic Processes.
A TRIVARIATE VERSION OF LEVY'S EQUIVALENCE
G. Simons Feb. 1985 5 p
(Contract F49620-82-C-0009)
(AD-A153157; TR-90; AFOSR-85-0295TR) Avail: NTIS HC A02/MF A01 CSCL 12/1

In a recent paper, the author presents an elementary derivation of a discrete analogue of this result, for a symmetric simple random walk, which he then uses to derive Levy's equivalence. GRA

N85-28706# Technische Hogeschool, Delft (Netherlands). Dept. of Mathematics and Informatics.
A MULTIPLE REGRESSION TECHNIQUE FOR DETECTING OUTLIERS
A. Leroy (Vrije Univ., Brussels) and P. Rousseeuw 1984 20 p refs
(Rept-84-33) Avail: NTIS HC A02/MF A01

The least median of squares regression technique to lessen the impact of outlying observations is presented and alternatives are given. The output of a FORTRAN implementation of the technique, called PROGRES is illustrated. The results can be interpreted by graphical representation of the standardized residuals. It is shown how PROGRES can be used as a diagnostic tool in regression analysis. Simulations which compare robust and nonrobust regression estimators in different design situations are discussed. Author (ESA)

N85-28707# Center for Mathematics and Computer Science, Amsterdam (Netherlands). Dept. of Mathematical Statistics.
ON ESTIMATING TRANSITION INTENSITIES OF A MARKOV PROCESS WITH AGGREGATE DATA OF A CERTAIN TYPE
R. D. Gill Sep. 1984 16 p refs Submitted for publication
(CWI-MS-R8411; B8478781) Avail: NTIS HC A02/MF A01

Finite-state-space time-homogeneous Markov processes applied to demography problems are considered. One specific form of aggregate data is reported and method of estimation of the underlying Markov process is given. Author (ESA)

66 SYSTEMS ANALYSIS

Includes mathematical modeling; network analysis; and operations research.

N85-28708*# National Aeronautics and Space Administration, Washington, D. C.
ADDING COMPUTATIONALLY EFFICIENT REALISM TO MONTE CARLO TURBULENCE SIMULATION
C. Warren Campbell May 1985 21 p refs
(NASA-TP-2469; M-485; NAS 1.60:2469) Avail: NTIS HC A02/MF A01 CSCL 12B

Frequently in aerospace vehicle flight simulation, random turbulence is generated using the assumption that the craft is small compared to the length scales of turbulence. The turbulence is presumed to vary only along the flight path of the vehicle but not across the vehicle span. The addition of the realism of three-dimensionality is a worthy goal, but any such attempt will not gain acceptance in the simulator community unless it is computationally efficient. A concept for adding three-dimensional realism with a minimum of computational complexity is presented. The concept involves the use of close rational approximations to irrational spectra and cross-spectra so that systems of stable, explicit difference equations can be used to generate the turbulence. Author

N85-28709# Texas Univ., Austin. Center for Cybernetic Studies.
A GREEDY ALGORITHM FOR THE TRANSHIPMENT ALONG A SINGLE ROAD PROBLEM
A. I. Ali Oct. 1984 15 p
(Contract N00014-82-K-0295)
(AD-A152343; CCS-500) Avail: NTIS HC A02/MF A01 CSCL 12/2

This paper presents a specialized algorithm for the transhipment along a single line problem. The problem is a specially structured network flow problem for which basis structure is such that a

greedy algorithm can be employed for solution. The specialized algorithm is on the order of a hundred times faster than the primal simplex method on a graph. Author (GRA)

N85-28710# North Carolina Univ., Chapel Hill. Operations Research and Systems Analysis.
MAXIMUM FLOW IN PLANAR NETWORKS WITH EXPONENTIALLY DISTRIBUTED ARC CAPACITIES
V. G. Kulkarni and V. G. Adlakha Dec. 1984 42 p
(Grant AF-AFOSR-0140-84)
(AD-A153158; UNC/ORSA/TR-84/15; AFOSR-85-0286TR) Avail: NTIS HC A03/MF A01 CSCL 12/2

This paper develops methods for the exact computation of the distribution of the maximum flow and related quantities in a planar network with independent and exponentially distributed arc capacities. A continuous time Markov chain (CTMC) with upper triangular rate matrix and single absorbing state is equal to the value of maximum flow in the network. Recursive algorithms are developed for computing the distribution and moments of the maximum flow. Algorithms are also presented to compute the probability that a given cut is the minimum capacity cut in the network. The algorithms are efficient and computationally stable. Distribution of the maximum flow, given a minimum cut, is studied. GRA

N85-28711# Technische Hogeschool, Delft (Netherlands). Dept. of Mathematics and Informatics.
FUTURE DIRECTIONS IN OPERATIONS RESEARCH
Leonard Fortuin (Nederlandse Philips Bedrijven B.V.) and Freerk A. Lootsma 1984 36 p refs Submitted for publication
(Rept-84-24) Avail: NTIS HC A03/MF A01

The gap between Operations Research (OR) theoretical developments and the application of methods and techniques to analyze and solve real-life management problems is discussed. Developments of the mathematics of OR and of the application of OR in industrial practice are outlined. Author (ESA)

N85-28712# National Aerospace Lab., Amsterdam (Netherlands).
OPERATIONS RESEARCH
1983 15 p In DUTCH; ENGLISH summary Sponsored by Netherlands Agency of Aerospace Programs
(B8561897) Avail: NTIS HC A02/MF A01

Research projects were carried out to improve the effectiveness and safety of civil and military aircraft operations. Quantitative methods such as (computer) simulations (either on a deterministic or statistical basis), network planning, and linear programming are used. Intercontinental and continental civil aircraft traffic; air traffic in the vicinity of airports; and ground traffic at airports are discussed. Military flight path measurements, low level and ground attack missions, and electronic countermeasures are discussed.
Author (ESA)

67 THEORETICAL MATHEMATICS

Includes topology and number theory.

N85-28713# Texas Univ., Austin. Center for Cybernetic Studies.
THE ROLE OF DUALITY IN OPTIMIZATION PROBLEMS INVOLVING ENTROPY FUNCTIONALS, WITH APPLICATIONS TO INFORMATION THEORY
A. Ben-Tal, M. Teboulle, and A. Charnes Sep. 1984 23 p
(Contracts N00014-82-K-0295; N00014-81-C-0236; Grant NSF ECS-82-14081)
(AD-A152336; CCS-497) Avail: NTIS HC A02/MF A01 CSCL 05/2

We consider infinite dimensional optimization problems involving entropy-type functionals in the objective function as well as in the constraints. A duality theory is developed for such problems and applied to the reliability rate function problem in Information Theory. Author (GRA)

N85-28714# Yale Univ., New Haven, Conn. Dept. of Computer Science.
ON THE CONDITION NUMBER OF MODIFIED MOMENT MATRICES ARISING FROM LEAST SQUARES APPROXIMATION IN THE COMPLEX PLANE
Y. Saad 3 Jan. 1985 12 p
(Contracts N00014-82-K-0184; DE-AC02-81ER-10996)
(AD-A152353; YALEU/DCS/RR-347) Avail: NTIS HC A02/MF A01 CSCL 12/1

This paper analyses the growth of the condition number of a class of modified moment matrices that arise when computing least squares polynomials in polygons of the complex plane. It is shown that if the polygon is inserted between two ellipses then the condition number of the $(n+1) \times (n+1)$ modified moment matrix is upper bounded by $2m(n+1)$ squared (k)2n power, where m is the number of edges of the polygon, and $k > \text{or} = 1$ is a known ratio which is close to one if the two ellipses are close to each other. GRA

N85-28715# Oak Ridge National Lab., Tenn. Mathematical Sciences Section.
TORUS DATA FLOW FOR PARALLEL COMPUTATION OF MISSIZED MATRIX PROBLEMS
R. E. Funderlic and George A. Geist Feb. 1985 31 p refs
(Contract DE-AC05-84OR-21400)
(DE85-008761; ORNL-6125) Avail: NTIS HC A03/MF A01

A data flow approach was used to solve large dense systems of equations on a processor array with only nearest neighbor communication between the processors. Although this approach requires no global synchronization, it was noticed that through the development of a simulator local synchronization of data movement is necessary when there are more computational nodes than processors (i.e., when the problem is missized). New definitions for missized problems and parallel algorithm efficiency are given. For the Cholesky decomposition the lower triangle was mapped onto a torus configuration of processors. This implementation was compared to the theoretical peak speed. Various time step, efficiency, and processor utilization plots are given. DOE

70 PHYSICS (GENERAL)

For geophysics see *46 Geophysics*. For astrophysics see *90 Astrophysics*. For solar physics see *92 Solar physics*.

N85-28716*# National Aeronautics and Space Administration, Washington, D. C.
OPTIMUM DIMENSIONS OF POWER SOLENOIDS FOR MAGNETIC SUSPENSION
B. A. Kaznacheyev May 1985 8 p refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved.: Elektromekh. (Novocherkassk, USSR), no. 2, Feb. 1984 p 94-96 Previously announced as N85-13118 Transl. by The Corporate Word, Pittsburgh, Pa.
(Contract NASw-4006)
(NASA-TM-77864; NAS 1.15:77864) Avail: NTIS HC A02/MF A01 CSCL 20C

Design optimization of power solenoids for controllable and stabilizable magnetic suspensions with force compensation in a wind tunnel is shown. It is assumed that the model of a levitating body is a sphere of ferromagnetic material with constant magnetic permeability. This sphere, with a radius much smaller than its distance from the solenoid above, is to be maintained in position on the solenoid axis by balance of the vertical electromagnetic force and the force of gravitation. The necessary vertical (axial) force generated by the solenoid is expressed as a function of relevant system dimensions, solenoid design parameters, and physical properties of the body. Three families of curves are obtained which depict the solenoid power for a given force as a function of the solenoid length with either outside radius or inside radius as a variable parameter and as a function of the outside radius with inside radius as a variable parameter. The curves indicate the optimum solenoid length and outside radius, for

minimum power, corresponding to a given outside radius and inside radius, respectively. R.J.F.

N85-28717# Vermont Univ., Burlington.
EUROPEAN SCIENCE NOTES, VOLUME 39, NUMBER 3 Monthly Publication
L. E. Shaffer Mar. 1985 62 p
(AD-A152446; ESN-39-3) Avail: NTIS HC A04/MF A01 CSCL 05/2

European Science Notes (ESN) is a monthly publication with brief articles on recent developments in European scientific research. The publication is not intended to be part of the scientific literature. The value of ESN articles to Americans is to call attention to current developments in European science and technology and to the institutions and people responsible for these efforts. ESN authors are primarily ONRL staff members. Occasionally articles are prepared by or in cooperation with staff members of the USAF European Office of Aerospace Research and Development or the US Army Research, Development and Standardization Group. Qualified US scientists travelling in Europe may also be invited to write an ESN article. Topics include: Behavioral Sciences; Biological Sciences; Computer Sciences; Material Sciences; Mathematics; Mechanics; Physics; Space Sciences; and Technology. GRA

N85-28718# Office of Naval Research, London (England).
PRESENT STATUS OF PHYSICS RESEARCH IN SPAIN: SOME IMPRESSIONISTIC REMARKS
P. Roman 8 Mar. 1985 10 p
(AD-A152455) Avail: NTIS HC A02/MF A01 CSCL 05/1

When monitoring scientific life and reporting on progress in Europe and the Middle East, there is an unmistakable tendency to focus on the more developed, highly industrialized countries. But rapidly developing countries often offer many surprises in all social and intellectual areas. Conditions and performance factors of research are no exception. Unfortunately, the American scientific community very often gets a slanted picture. While shortcomings are easy to detect and are brought home forcefully to a visitor by his less fortunate fellow scientists, it is important not only to mention general assets and positive trends but also to highlight specific examples of promising new events. One of the most interesting recent developments I saw was an ongoing, concentrated, and well-coordinated effort which aims to build up a very significant Spanish research base in the area of microelectronics. GRA

N85-28719# Stanford Linear Accelerator Center, Calif.
MAGNETIC MONOPOLES
David Fryberger Dec. 1984 18 p refs Presented at the Appl. Superconductivity Conf., San Diego, Calif., 9-13 Sep. 1984
(Contract DE-AC03-76SF-00515)
(DE85-008176; SU-SLAC-Pub-3535; CONF-840937-28) Avail: NTIS HC A02/MF A01

A brief review of the historical background of magnetic monopoles is given. Descriptions of what several different types of monopoles might look like are presented. Finally the experimental situation is discussed. DOE

N85-28720# GA Technologies, Inc., San Diego, Calif.
HOW A SWING BEHAVES
John M. Greene Jan. 1985 51 p refs Presented at the Conf. on Solitons and Coherent Struct., Santa Barbara, Calif., 11 Jan. 1985
(Contract DE-AT03-84ER-53158)
(DE85-008280; GA-A-17888; CONF-850165-1) Avail: NTIS HC A04/MF A01

There has been very considerable progress in the past few years on the theory of two conservative, coupled, nonlinear oscillators. This is a very general theory, and applies to many equivalent systems. A typical problem of this class has a solution that is so complicated that it is impossible to find an expression for the state of the system that is valid for all time. However, recent results are making it possible to determine the next most useful type of information. This is the asymptotic behavior of individual orbits in the limit of very long times. It is just the information that is desired in many situations. Renormalization which seems to be the key to the present understanding of this problem, is discussed. DOE

N85-28721# Oak Ridge National Lab., Tenn.
EXPERIENCE WITH OEPRATION OF A LARGE MAGNET SYSTEM IN THE INTERNATIONAL FUSION SUPERCONDUCTING MAGNET TEST FACILITY
W. A. Fietz, J. F. Ellis, P. N. Haubenreich, S. W. Schwenterly, and R. E. Stamps 1985 6 p refs Presented at the 6th Topical Meeting on the Technol. of Fusion Energy, San Francisco, 3 Mar. 1985
(Contract DE-AC05-84CR-21400)
(DE85-009288; CONF-850310-39) Avail: NTIS HC A02/MF A01

Superconducting toroidal field systems, including coils and ancillaries, are being developed through international collaboration in the Large Coil Task. The focal point is a test facility in Oak Ridge where six coils will be tested in a toroidal array. Shakedown of the facility and preliminary tests of the first three coils (from Japan, Switzerland, and the US) were accomplished in 1984. Useful data were obtained on performance of the helium refrigerator and distribution system, power supplies, control and data acquisition systems and voltages, currents, strains, and acoustic emission in the coils. Performance was generally gratifying except for the helium system, where improvements are being made. DOE

71 ACOUSTICS

Includes sound generation, transmission and attenuation. For noise pollution see *45 Environment Pollution.*

N85-28722 Metals Society, London (England).
METHOD OF ASSESSMENT OF START OF SLOW CRACK GROWTH BY ACOUSTIC EMISSION TECHNIQUE
D. Racko 3 Jan. 1985 12 p refs Transl. into ENGLISH from Zvaranie (Czechoslovakia), no. 7, 1982 p 208-212
(BLL-BISI-Trans-21762-(9022.06)) Avail: British Library Lending Div., Boston Spa, Engl.

The assessment of the start of slow crack growth, representing one of the actors limiting the application of the elastic-plastic ways of fracture mechanics is presented. Application of the acoustic emission method is reasoned by a high sensitivity of that technique for the microdynamical phenomena taking place in front of crack at slow crack growth. Because of a high sensitivity it is necessary to determine here the range of the separating variations that correspond to the start and initiation of slow crack growth. The proposed mode of determination of the separating variations for assessment of the stages of slow crack growth begins with phyaical and statistical analysis of the phenomena taking place in front of the crack. Because the boundary between the different phases of activities of the microdynamic phenomena is assessed by a point on the curve of the sum of acoustic emission (characterized by the relevant ASTM standard the variation in behavior of that curve into active and/or critical-active variation) the start of slow crack growth can be determined by this standard. Author

N85-28723 Metals Society, London (England).
[DETECTING AND ANALYZING CRACK DEFECTS]
Dec. 1983 25 p refs Transl. into ENGLISH from various West German articles
(BLL-BISI-Trans-22062-(9022.06)) Avail: British Library Lending Div., Boston Spa, Engl.: £13.00, overseas $30.00

Methods for detecting and analyzing defects are put forward. The dependence on obliquity and the effect of roughness are discussed, as is the determination of defect length and the effects of edge diffraction. Also presented is the crack tip method for determination of crack depth. For individual titles, see N85-28724 through N85-28725.

N85-28724 Metals Society, London (England).
ECHO-RESPONSE FROM CRACK-LIKE TWO-DIMENSIONAL REFLECTORS IN FOCUSED ULTRASONIC FIELDS

F. Walte and W. Mueller *In its* Detecting and Analyzing Crack Defects (BLL-BISI-Trans-22062-(9022.06)) Dec. 1983 19 p refs Transl. into ENGLISH from Materialpruefung (Duesseldorf), pt. 1, v. 25, no. 5, 1983 p 155-158 and pt. 2, v. 25, no. 7, 1983 p 235-237 (For primary document see N85-28723 17-71)
Avail: British Library Lending Div., Boston Spa, Engl.: £13.00; overseas $30.00

Focussing probes with their high resolution show considerable benefits for defect analysis. Little reliance was placed on their effectiveness in the past, because of the marked mirror effect of large surface defects steeply inclined towards the acoustic axis. The dependence on obliquity and the effect of roughness are discussed in Part 1 and the determination of defect length and the effects of edge diffraction in Part 2. Author

N85-28725 Metals Society, London (England).
ULTRASONIC CRACK TIP METHOD FOR THE DETERMINATION OF CRACK DEPTH
A. Hess and C. Thomas *In its* Detecting and Analyzing Crack Defects (BLL-BISI-Trans-22062-(9022.06)) Dec. 1983 4 p refs Transl. into ENGLISH from Materialpruefung (Duesseldorf), v. 25, no. 10, 1983 p 340 Original language document was announced in IAA as A84-14199 (For primary document see N85-28723 17-71)
Avail: British Library Lending Div., Boston Spa, Engl.: £13.00; overseas $30.00

A variant of the ultrasonic method of crack depth measurement is presented. The crack is detected by the reflecting square effect during slanting acoustic input with transverse waves. An additional echo besides the reflecting square echo is observed when the test head is shifted in the direction of the crack during heightened amplification. This additional echo is caused by secondary waves propagating from the crack tip. The crack depth is determined by the transit time differences between the echoes. Test results using the method for different conditions are briefly described. C.D.

N85-28726*# Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Electrical Engineering.
MEASUREMENT OF ULTRASONIC FIELDS IN TRANSPARENT MEDIA USING A SCANNING DIFFERENTIAL INTERFEROMETER Final Report
G. Daniel Dockery and Richard O. Claus 30 Sep. 1983 36 p refs
(Grant NAG1-263)
(NASA-CR-175921; NAS 1.26:175921) Avail: NTIS HC A03/MF A01 CSCL 20A

An experimental system for the detection of three dimensional acoustic fields in optically transparent media using a dual beam differential interferometer is described. In this system, two coherent, parallel, focused laser beams are passed through the specimen and the interference fringe pattern which results when these beams are combined shifts linearly by an amount which is related to the optical pathlength difference between the two beams. It is shown that for small signals, the detector output is directly proportional to the amplitude of the acoustic field integrated along the optical beam path through the specimen. A water tank and motorized optical platform were constructed to allow these dual beams to be scanned through an ultrasonic field generated by a piezoelectric transducer at various distances from the transducer. Scan data for the near, Fresnel, and far zones of a uniform, circular transducer are presented and an algorithm for constructing the radial field profile from this integrated optical data, assuming cylindrical symmetry, is described. Author

N85-28727# Colorado School of Mines, Golden. Center for Wave Phenomena.
KIRCHHOFF MODELING VIA WAVE EQUATION DATUMING
M. Sullivan 29 Jan. 1985 37 p
(Contract N00014-84-K-0049)
(AD-A152399; CWP-017) Avail: NTIS HC A03/MF A01 CSCL 12/1

The acoustic reflection response of a plane wave on a cylindrical surface is calculated from a specialization of the Kirchhoff integral. Computational advantages are obtained by assuming that structural changes occur only along the direction of data collection. Off-line geologic invariance permits an integral to be replaced by a short convolution operator. The restriction to single interface modeling permits implementation of personal computers. Also, the single layer algorithm provides the framework for a multilayer code. Details on implementation, example executions, and program listings are included. GRA

N85-28728# Admiralty Marine Technology Establishment, Teddington (England).
NUMERICAL EVALUATION OF LOW FREQUENCY SOUND PROPAGATION IN LAYERED MEDIA
E. A. Skelton Feb. 1985 41 p
(AD-A152690; AMTE(N)TM85015; BR94899) Avail: NTIS HC A03/MF A01 CSCL 12/1

A horizontally layered system of fluids and solids is bounded above and below by half-spaces which may be solid or fluid. The method of dynamic stiffness coupling is used to obtain a matrix relation connecting spectral displacements and external stresses at the interfaces. The pressure due to a time-harmonic acoustic point source is obtained, via this matrix relation, by numerical evaluation of a Hankel transform; exactly using a Gaussian quadrature formula and approximately using the FFT algorithm. Numerical results demonstrate that the FORTRAN programs are a valuable tool for predicting short-range sound propagation at low frequencies. Author (GRA)

N85-28168# Joint Publications Research Service, Arlington, Va.
SCATTERING OF SOUNDS BY PIEZOCERAMIC CYLINDRICAL SHELL NEAR RIGID SURFACE Abstract Only
I. V. Senchenko *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-85-004) 15 May 1985 p 90 Transl. into ENGLISH from Prikl. Mekhan. (Kiev), v. 20, no. 7, Jul. 1984 p 111-115 (For primary document see N85-28142 17-31)
Avail: NTIS HC A06/MF A01

N85-28170# Joint Publications Research Service, Arlington, Va.
ACOUSTIC OSCILLATIONS OF RODS AND PLATES Abstract Only
A. V. Zakharov, A. R. Fazylov, and R. Kh. Pirmatov *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-85-004) 15 May 1985 p 92 Transl. into ENGLISH from Izv. Akad. Nauk Tadzhiksoy SSR Otd. Fiz.-Mat., Fiz. i Geol. Nauk (USSR), no. 2 (92), Apr. - Jun. 1984 p 28-33 (For primary document see N85-28142 17-31)
Avail: NTIS HC A06/MF A01

N85-28398# Plessey Marine Research Unit, Templecombe (England).
SOUND INTENSITY MEASUREMENT
P. S. Watkinson *In* Shock and Vibration Information Center The Shock and Vibration Digest, Vol. 17, No. 1 Jan. 1985 p 3-14 refs (For primary document see N85-28397 17-39)
Avail: SVIC, Code 5804, Naval Research Lab., Washington, D.C. 20375 CSCL 20/11

72 ATOMIC AND MOLECULAR PHYSICS

Includes atomic structure and molecular spectra.

N85-28729 United Kingdom Atomic Energy Authority, Harwell (England). Theoretical Physics Div.
NEUTRON SCATTERING AND REACTIONS ON 59Co FROM 1 TO 20 MeV
D. Wilmore and P. E. Hodgson (Nuclear Physics Lab., Oxford) Jan. 1985 36 p refs
(AERE-R-11439) Copyright. Avail: Issuing Activity

The aim was to make a complete analysis of all the interactions of neutrons with 59Co in the energy range 1-20 MeV, excluding the resonance region at very low energies. In this energy region the interactions change in character and this is reflected in the cross-sections and in the methods used to analyze them. At low energies the compound nucleus mechanism dominates, and the

corresponding on-elastic cross-sections may be evaluated using the Hauser-Feshbach formalism. The elastic, total and absorption cross-sections are evaluated using the optical model, which also provides the potentials used in the Hauser-Feshbach calculations. At higher energies there are increasing contributions from direct reactions, and from multistep processes. The overall energy variations of the total cross-sections of the competing reactions are given. The most important non-elastic process is neutron inelastic scattering, which includes (n,2n) reactions, and there are smaller contributions from the (n,p) and (n,alpha) reactions. At higher energies, several reactions like (n,np) and (n,n alpha) involving the emission of two particles become energetically possible. R.J.F.

N85-28730# Texas A&M Univ., College Station. Dept. of Chemistry.
LUMINESCENCE PROBE STUDIES OF IONOMERS. I: STEADY-STATE MEASUREMENTS FROM NAFION MEMBRANE
M. N. Szentirmay, N. E. Prieto, and C. R. Martin 3 Feb. 1985 43 p
(Contract N00014-82-K-0612)
(AD-A152475; AD-E440273; TR-8) Avail: NTIS HC A03/MF A01 CSCL 07/1

Steady state luminescence probe methods were used to study the polarity of the ionic cluster phase within Nafion 117 membrane. Three probes, pyrene, a cationic dansyl derivative and Ru(bpy) 3(2+) were used. In fully hydrated Nafion membranes (ca. 40% water by weight), these probes report back microenvironment polarities significantly lower than bulk water. In addition, these probes show that the -SO3H sites are chemically heterogeneous. The effects of water content and counterion on cluster phase polarity were also evaluated. The cluster phase can become quite nonpolar when water is removed and/or when a hydrophobic counterion is added. The effects of the Nafion chemical environment on the dynamics and thermodynamics of chemical processes occurring within the polymer are discussed and demonstrated. GRA

N85-28731# State Univ. Coll. of New York, Buffalo. Dept. of Physics.
MEMORY FUNCTION FOR CYCLOTRON RESONANCE OF TWO-DIMENSIONAL ELECTRON SYSTEMS Scientific Paper, 1 Jun. 1984 - 31 May 1985
A. Isihara and Y. Shiwa 25 Mar. 1985 17 p
(Contract N00014-84-K-0387)
(AD-A152632; K0387-6) Avail: NTIS HC A02/MF A01 CSCL 20/8

Coulomb effects on cyclotron resonance in two-dimensional electron systems are investigated based on a self-consistent approach which improves the random-phase approximation. The memory function in the dynamic magnetoconductivity depends on the electron density not only through the filling factor v but also on its combination with the dimensionless density parameter r sub s in the form r sub s v to the 3/2 power. The memory function reproduces the data of Wilson, Allen and Tsui for intermediate densities. GRA

N85-28732# State Univ. Coll. of New York, Buffalo. Dept. of Physics.
EFFECTS OF LEVEL BROADENING ON THE MAGNETOTHERMAL OSCILLATIONS IN TWO-DIMENSIONAL ELECTRON SYSTEMS Report, 1 Jun. 1984 - 31 May 1985
A. Isihara and Y. Shiwa 25 Mar. 1985 36 p
(Contract N00014-84-K-0387)
(AD-A152639; AD-F300599) Avail: NTIS HC A03/MF A01 CSCL 20/8

Under adiabatic changes of strong magnetic fields, two-dimensional electron systems are expected to show strong temperature oscillations, from which the fundamental constant of the Bohr magneton can be determined. The impurity and temperature sensitivity may have practical applications. GRA

N85-28733# Washington Univ., Seattle. Dept. of Chemistry.
AVERAGE COLLISIONAL VIBRATIONAL ENERGY TRANSFER QUANTITIES AND THE INVERSION TEMPERATURE
D. C. Tardy and B. S. Rabinovitch 15 Mar. 1985 19 p Prepared in cooperation with Iowa Univ., Iowa City
(Contract N00014-75-C-0690)
(AD-A152674; TR-31) Avail: NTIS HC A02/MF A01 CSCL 20/8

Collisional efficiencies for vibrational energy transfer have previously been related to certain quantities, which have been examined here as a function of molecular complexity, critical reaction threshold, E sub O temperature and energy transfer step size. Model calculations were made for the decomposition of nitryl chloride and for the isomerizations of methyl isocyanide, cyclopropane and cycloheptatriene. GRA

N85-28734# United Technologies Research Center, East Hartford, Conn.
ROTATIONAL RELAXATION STUDIES OF HYDROGEN FLUORIDE Final Summary Report, 1 Jun. 1983 - 31 Dec. 1984
J. J. Hinchen 28 Feb. 1985 28 p
(Contract F49620-83-C-0098)
(AD-A152711; UTRC/R85-956539-1; AFOSR-85-0302TR) Avail: NTIS HC A03/MF A01 CSCL 20/8

Two double laser resonance experiments of collisional hole filling and vibration to rotation transfer have been used to determine rotational relaxation rates for hydrogen fluoride. The rates for rotational levels J2 through J14 range from 55,000,000/sec/torr to 2,000,000 sec/torr and these results are described by kinetic rate models. The rates increase with temperature by about 20 percent 300 K and 1000 K. The effect of several added gases on the rates has been measured. Vibration to rotation transfer proceeds by the accepted vibrational relaxation rate. A significant fraction of V=1 population is transferred with about 35 percent passing through the levels J10 - J14 of V=0. GRA

N85-28735# California Univ., Santa Barbara. Dept. of Chemistry.
AN EXAMINATION OF THE USE OF WAVE PACKETS FOR THE CALCULATION OF ATOM DIFFRACTION BY SURFACE Annual Technical Report
B. Jackson and H. Metiu Mar. 1985 41 p
(Contract N00014-81-K-0598)
(AD-A152760; TR-14) Avail: NTIS HC A03/MF A01 CSCL 20/8

The authors use analytic models valid for neutron scattering and numerical calculations to examine a method proposed by Drolshagen and Heller for computing atom diffraction from surfaces. Our main concern is the manner in which the use of narrow packets causing a partial coherence of the incident beam, might affect the diffracted intensity. We find that the demands of representing beam coherence correctly conflict with the requirements for the validity of the propagation scheme. We suggest some improvements that should increase the reliability of the method without affecting greatly its remarkable computational and conceptual advantages. GRA

N85-28736# California Univ., Santa Barbara. Dept. of Chemistry.
THE TEMPERATURE DEPENDENCE OF DIFFRACTED BEAM INTENSITIES IN ATOM-SURFACE SCATTERING Annual Technical Report
B. Jackson and H. Metiu Mar. 1985 35 p
(Contract N00014-81-K-0598)
(AD-A152762; TR-16) Avail: NTIS HC A03/MF A01 CSCL 20/8

We develop a new method for the calculation of the atom scattering analog of the Debye-Waller factor. Unlike X-ray and neutron scattering the properties of an atom scattered by a solid surface cannot be computer by perturbation theory, therefore the simple Debye-Waller theory cannot be applied. Nevertheless the Debye-Waller phenomenon has a close analog: the elastic intensity

is depressed due to the uncorrelated part of the thermal motion of the lattice atoms. To compute this effect we develop a time dependent scattering theory in which the quantum properties of the scattered atom are described by propagating coherently an ensemble of wave packets and lattice motion is simulated by a classical Langevin equation. Applications are made to He and Ne scattering from a surface whose lattice dynamics mimics that of Pt(111) but whose corrugation was slightly increased to enrich the diffraction structure. Author (GRA)

N85-28737# California Univ., Santa Barbara. Dept. of Chemistry.
A NUMERICAL STUDY OF THE MEAN TRAJECTORY APPROXIMATION IN A NON-ADIABATIC PROCESS Annual Technical Report
S. I. Sawada and H. Metiu Mar. 1985 63 p
(Contract N00014-81-K-0598)
(AD-A152763; TR-18) Avail: NTIS HC A04/MF A01 CSCL 20/8

We present numerical results obtained with the mean trajectory approximation applied to a non-adiabatic process described by a curve crossing model. We compare them to the results given by the customary trajectory approximation which uses one adiabatic potential to generate the nuclear motion, and to the results given by Nikitin's formula. We find that at low kinetic energy the three procedures give very different results. The differences are caused by the fact that the mean trajectory method includes quantum effect in the effective potential used for the classical motion. We also discover an unexpected behavior: under certain conditions the transition probability seems to become a random function of the incident energy. Author (GRA)

N85-28738# Avco-Everett Research Lab., Mass.
EXPERIMENTAL STUDY OF DISSOCIATIVE ATTACHMENT IN OPTICALLY-PUMPED LITHIUM MOLECULES Final Report, 1 Mar. - 31 Oct. 1984
M. W. McGeoch and R. E. Schlier Jan. 1985 28 p
(Contract F49620-84-C-0044)
(AD-A152800; AFOSR-85-0284TR) Avail: NTIS HC A03/MF A01 CSCL 20/8

The first experimental observations of dissociative attachment in lithium dimmer molecules are presented. Lithium molecules are optically pumped via the Li2(B) electronic state into selected levels of the ground electronic state. Low energy electrons are created by two-step laser photoionization of lithium atoms. Product Li ions are detected by time-of-flight spectrometry. Preliminary analysis of the data gives a rate constant of .3 x 10 to the 8th power cc/sec for the attachment of 0.1 eV electrons to lithium vibrational states v = 8 to v =12 without strong dependence on the selected states. GRA

N85-28739# Georgia Univ., Athens. Dept. of Physics and Astronomy.
A STUDY OF EXCITATIONS DURING COLLISIONALLY-INDUCED ELECTRON DETACHMENT OF NEGATIVE IONS Annual Report, 1 Aug. 1983 - 31 Jul. 1984
M. G. Menendez and M. M. Duncan 31 Jul. 1984 23 p refs
(Grant AF-AFOSR-0264-83)
(AD-A152879; AFOSR-85-0290TR) Avail: NTIS HC A02/MF A01 CSCL 20/8

Measurements of the double differential cross sections for the electron detachment of the negative ion of hydrogen upon collision with atomic targets were made around 1 MeV. The double differential cross section at and near zero degrees in the laboratory frame for the single electron detachment was found to account for all of the structure seen in the total double differential cross section. Although quantitative data do not yet exist, it is clear that the double electron detachment process does not contribute significantly to the total double differential cross section at zero degrees. Hence, the non specific cross sections were used to investigate details of the angular, incident energy, and target dependencies of the structure. The results strongly indicate that a portion of the structure is a manifestation of leaving the final state projectile, the hydrogen atom, in an excited state. A modified version of the electron energy analyzer which permits measurement of Lyman alpha photons coincident with ejected electrons was completed. This version of the analyzer will be used to measure directly the electron energy spectrum coincident with excitation of the hydrogen atom to the 2p state. GRA

N85-28740# Louisiana State Univ., Baton Rouge. Dept. of Physics and Astronomy.
CLUSTERS OF TRANSITION METAL ATOMS Final Report, 20 Oct. 1980 - 19 Dec. 1984
J. Callaway Jan. 1985 9 p
(Contract DAAG29-81-K-0006)
(AD-A153126; ARO-17235.7-PH) Avail: NTIS HC A02/MF A01 CSCL 07/2

The problem addressed in the work supported was to develop a method for accurate all electron self consistent calculations of the electronic structure of small clusters of transition metal atoms on the basis of both local spin density functional theory and of symmetrized combinations of Gaussian orbitals. Our intention was to use the clusters to study the effects of small concentrations of foreign atoms in transition metal hosts (example: carbon in iron), because calculations for clusters could be made self consistent to an extent not normally possible for impurities in bulk solids. Subsequently, experimental observations of the properties of iron clusters by research groups at the Exxon laboratories and elsewhere have stimulated us to consider free clusters in more detail. GRA

N85-28741# Stanford Linear Accelerator Center, Calif.
IMPLICATIONS FOR SUPERSYMMETRY OF THE CERN MONOJETS
Howard E. Haber Jan. 1985 5 p refs Presented at the Am. Phys. Soc. Meeting, Santa Fe., N. Mex., 31 Oct. - 3 Nov. 1984
(Contracts DE-AC03-76SF-00515; DE-AM03-76SF-00010)
(DE85-008178; SU-SLAC-PUB-3550; CONF-8410222-14) Avail: NTIS HC A02/MF A01

Supersymmetric processes which could give monojet events similar to those observed at the CERN Sp anti pS were studied. If supersymmetry is the explanation of the monojets, strict bounds are obtained on possible supersymmetric masses. DOE

N85-28742# Stanford Linear Accelerator Center, Calif.
PHOTON-PHOTON COLLISIONS
Stanley J. Brodsky Jan. 1985 10 p refs Presented at the 6th Intern. Workshop on Photon-Photon Collisions, Lake Takoe, Calif., 10-13 Sep. 1984
(Contract DE-AC03-76SF-00515)
(DE85-008056; SU-SLAC-PUB-3547; CONF-8409194-2) Avail: NTIS HC A02/MF A01

The study of photon-photon collisions has progressed, stimulated by new data and new calculational tools for QCD. In the future precise determination are expected of (ALPHA)/sub s/ and (LAMBDA)/sup ms/ from the (GAMMA)*(GAMMA) (YIELDS) (PI) (0) form factor and the photon structure function, and detailed checks of QCD, determination of the shape of the hadron distribution amplitudes from (GAMMA) (GAMMA) (YIELDS) H anti-H, reconstruction of sigma/sub (GAMMA) (GAMMA)/ from exclusive channels at low W/sub (GAMMA)(GAMMA/, definitive studies of high p/sub T/ hadron and jet production, and studies of threshold production of charmed systems. Photon-photon collisions, along with radiative decays of the psi and UPSILON, are ideal for the study of multiquark and gluonic resonances. The potential for resonance formation near threshold in virtually every hadronic exclusive channel, including heavy quark states c anti c c anti c, c anti c u anti u, are emphasized. At higher energies SLC, LEP, ...) parity-violating electroweak effects and Higgs production due to equivalent Z(0) and W(+-) beams from e (YIELDS) eZ(0) and e (YIELDS) nu W will be important. Author

N85-28743# Oak Ridge National Lab., Tenn.
EXPERIMENTAL APPROACHES TO THE MEASUREMENT OF DIELECTRONIC RECOMBINATION

S. Datz 1984 5 p refs Presented at Workshop on Atomic Spectra and Collisions in External Fields, Gaithersburg, Md., 22 Oct. 1984
(Contract DE-AC05-84OR-21400)
(DE85-00627; CONF-8410237) Avail: NTIS HC A02/MF A01

In dielectronic recombination, the first step involves a continuum electron which excites a previously bound electron and, in so doing, loses just enough energy to be captured in a bound state (n1). This results in a doubly excited ion of a lower charge state which may be either autoionized or emit a photon resulting in a stabilized recombination. The complete signature of the event is an ion of reduced charge and an emitted photon. Methods of measuring this event are discussed. DOE

N85-28744# California Univ., Berkeley. Lawrence Berkeley Lab.
EXPERIMENTS WITH LIGHT IONS AT CERN SUPER PROTON SYNCHROTRON
H. G. Pugh Dec. 1984 17 p refs Presented at 7th High Energy Heavy Ion Study Conf., Darmstadt, West Germany, 8 Oct. 1984
(Contract DE-AC03-76SF-00098)
(DE85-007625; LBL-18779; CONF-8410210-9) Avail: NTIS HC A02/MF A01

The CERN-GSI-LLBL plan to install an injector for light ions at the CERN SPS is reviewed, and an outline is given of the experiments so far approved by CERN for a 50 A GeV and 225 A GeV running in 1986-1987. DOE

N85-28745# Fermi National Accelerator Lab., Batavia, Ill.
PHOTON STRUCTURE FUNCTION: THEORY
W. A. Bardeen Dec. 1984 14 p refs Presented at 6th Intern. Workshop on Photon-Photon Collisions, Lake Tahoe, Calif., 9 Sep. 1984
(DE85-008064; FNAL/C-84/133-T; CONF-8409194-3) Avail: NTIS HC A02/MF A01

The theoretical status of the photon structure function is reviewed. Particular attention is paid to the hadronic mixing problem and the ability of perturbative QCD to make definitive predictions for the photon structure function. DOE

N85-28746# Fermi National Accelerator Lab., Batavia, Ill.
MEASURING STRUCTURE FUNCTIONS AT SSC ENERGIES
J. G. Morfin and J. F. Owens (Florida State Univ., Tallahassee) Jan. 1985 6 p refs Presented at Design and Utilization of the Superconducting Super Collider Summer Study, Snowmass, Colo., 23 Jun. 1984
(Contract DE-AC02-76CH-03000)
(DE85-007515; FNAL/C-85/15; CONF-8406198-42) Avail: NTIS HC A02/MF A01

Topics discussed include measuring (LAMBDA), tests of QCD using hard scattering processes, and measuring parton distributions. In each case, any opportunities and advantages afforded by the unique features of the superconducting super collider are emphasized. The working group on structure functions was charged with investigating two specific questions: (1) How well are the various parton distributions known in the kinematic region relevant to calculations for the SSC. (2) What new information can be learned about parton distributions at the SSC. The advantages of having a fixed target facility at the SSC for the measurement of the parton distributions with multi-TeV leptons, were to be examined. Author

N85-28747# Tennessee Univ., Knoxville. Dept. of Physics.
NONRELATIVISTIC THEORY OF HEAVY-ION COLLISIONS
G. Bertsch 17 Jul. 1984 38 p refs Presented at the Intern. School of Heavy Ion Phys., Frontiers in Nucl. Dyn. Course, Erice, Italy Prepared in cooperation with ORNL
(Contract DE-AC05-84OR-21400)
(DE85-007538; CONF-840708-1) Avail: NTIS HC A03/MF A01

A wide range of phenomena is observed in heavy-ion collisions, calling for a comprehensive theory based on fundamental principles of many-particle quantum mechanics. At low energies, the nuclear dynamics is controlled by the mean field, as known from spectroscopic nuclear physics. The comprehensive theory of collisions is expected to contain mean-field theory at low energies. This theory can be studied quantum mechanically, in which form it is called TDHF (time-dependent Hartree-Fock), or classically, where the equation is called the Vlasov equation. DOE

N85-28748# Brookhaven National Lab., Upton, N. Y. Physics Dept.
EXPERIMENTS AND DETECTORS FOR HIGH ENERGY HEAVY ION COLLIDERS
T. Ludlam 1984 22 p refs Presented at the Instr. for Heavy Ion Nucl. Res. Conf., Oak Ridge, Tenn., 22-24 Oct. 1984
(Contract DE-AC02-76CH-00016)
(DE85-007927; BNL-35982; CONF-841005-11) Avail: NTIS HC A02/MF A01

Problems and possibilities are discussed for experiments at the highest collision energies achievable in manmade accelerators; i.e., colliding beams of heavy nuclei at cm energies greater than or equal to 100 GeV/amu, well beyond the threshold of nuclear transparency. The final state consists of two hot, dense, baryon-rich fireballs flying away from each other at large rapidity (the fragmentation regions), and thermally-produced particles with near-zero net baryon number populating the central rapidity range. The matter produced at central rapidity may reach extremely high temperatures and energy densities, and it is expected to produce thermodynamic conditions similar to those which existed when the early universe condensed from a plasma of quarks and gluons to a gas of hadrons. The problem of tracking, lepton measurements, and calorimeters are discussed. DOE

N85-28749# Rockefeller Univ., New York.
EXPERIMENTAL STUDIES OF DIFFRACTIVE PHENOMENA
Rodney L. Cool 25 Oct. 1984 28 p refs Presented at the Old and New Probl. in Fundamental Phys. Meeting, Pisa, Italy, 25-26 Oct. 1984
(Contract DE-AC02-81ER-40033)
(DE85-006812; DOE/ER-40033/71; CONF-8410235-1) Avail: NTIS HC A03/MF A01

The coherent inelastic scattering process, usually called inclusive diffraction dissociation, is discussed. Topics included: t and M/sub x/ dependence, factorization, finite mass sum rule and charged particle multiplicities. DOE

N85-28750# Stanford Linear Accelerator Center, Calif.
WAKE FIELDS AND WAKE FIELD ACCELERATION
K. L. F. Bane, P. B. Wilson, and T. Weiland (Deutsches Elektronen-Synchrotron, Hamburg) Dec. 1984 28 p refs Presented at the 3rd Ann. Summer School on High Energy Accelerators, Upton, N.Y., 6-16 Jul. 1983
(Contract DE-AC03-76SF-00515)
(DE85-008054; SU-SLAC-PUB-3528; CONF-8307126-5) Avail: NTIS HC A03/MF A01

The concepts of wake fields and wake potentials, some basic properties of these functions, how they can be calculated, and a few important applications are examined. One such application is wake field acceleration. The wake field accelerator is capable of producing the high gradients required for future very high energy e(+)e(-) linear colliders. The principles of wake field acceleration, and a brief description of experiments in progress in this area, are presented in the concluding section. DOE

N85-28751# Washington Univ., Seattle. Nuclear Physics Lab.
SPIN DISTRIBUTIONS IN HEAVY ION FUSION AT AND BELOW THE COULOMB BARRIER
B. B. Back, S. Gil, A. Lazzarini, D. K. Lock, A. Ray, and R. Vandenbosch 1984 5 p refs Presented at the Intern. Conf. on Fusion Reactions Below the Coulomb Barrier, Cambridge, Mass., 13 Jun. 1984
(Contract DE-AC06-81ER-40048)
(DE85-007817; DOE/ER-40048/101-L4; CONF-8406156-6) Avail: NTIS HC A02/MF A01

The total cross section for compound nucleus formation at energies near the Coulomb barrier depends sensitively on the penetrability of the ion-ion potential. Many analyses of fusion data

have relied on the parabolic approximation to account for the barrier penetration. There has been a great amount of interest recently in studying the details of fusion at and near the barrier. The penetrability of the barrier not only affects the energy dependence of the capture cross section, but the angular momentum dependence of the penetrability also determines the spin distribution brought into the compound nucleus during the capture. The energy dependence of the cross section and (GAMMA) multiplicity for the reactions (ALPHA), (12)C, and (16)O + (154)Sm to determine the average properties of the spin distribution brought into the compound nucleus by fusion were studied. Results are presented and discussed. DOE

N85-28752# California Univ., Berkeley. Lawrence Berkeley Lab. Nuclear Science Div.
CLUSTER PRODUCTION AND ENTROPY
H. A. Gustafsson (Gesellschaft fuer Schwerionenforschung, Darmstadt, West Germany), K. G. R. Doss, H. H. Gutbrod (Gesellschaft fuer Schwerionenforschung, Darmstadt, West Germany), B. Kolb (Gesellschaft fuer Schwerionenforschung, Darmstadt, West Germany), H. Loehner (Ludwig-Maxmilian Univ., Munich), B. Ludewigt (Marburg Univ., West Germany), A. M. Poskanzer, T. Renner, H. Riedesel (Springer Verlag, Berlin, West Germany), H. G. Ritter (Gesellschaft fuer Schwerionenforschung, Darmstadt, West Germany) et al Jan. 1985 22 p refs Presented at the 7th High Energy Heavy Ion Study Conf., Darmstadt, West Germany, 8-12 Oct. 1984
(Contract DE-AC03-76SF-00098)
(DE85-007626; LBL-18949; CONF-8410210-8) Avail: NTIS HC A02/MF A01

Data on composite particle production as a function of multiplicity for different colliding systems and energies (Ca+Ca at 400 and 1050 MeV/n and Nb+Nb at 400 and 650 MeV/n) is presented. These data can be understood by the improved coalescence model taking the radius and temperature of the participant region, as well as the radius of the deuteron into account. The obtained radii for the interacting volume give chemical freeze out densities between 50 and 100% of normal nuclear density. Results on entropy production in the system studied by considering two different models for the determination of the entropy are presented. The results show large differences which clearly show that the determination of entropy produced in nuclear collisions is strongly model dependent. DOE

N85-28753# Georgia Univ., Athens. Dept. of Physics and Astronomy.
THEORETICAL STUDIES OF HEAVY ION SCATTERING PROCESSES Progress Report, 15 Aug. 1984 - 1 Mar. 1985
T. G. Heil 1985 10 p
(Contract DE-AS09-83ER-13098)
(DE85-008823; DOE/ER-13098/2) Avail: NTIS HC A02/MF A01

The physics of slow atomic collisions was studied. The studies include: general theory, numerical techniques and applications to particular collision processes. A number of well defined projects are discussed. The current status of each project is summarized and their scientific interest is discussed in the accompanying renewal proposal. DOE

N85-28754# Massachusetts Inst. of Tech., Cambridge. Plasma Fusion Center.
THE DESIGN OF MEGAWATT GYROTRONS
K. E. Kreischer, B. G. Danly, J. B. Schutkeker, and R. J. Temkin Dec. 1984 38 p refs
(Contract DE-AC02-78ET-51013)
(DE85-007892; MIT/PFC-JA-84-43) Avail: NTIS HC A03/MF A01

The design parameters of a 120 GHz gyromonotron capable of output powers in excess of 1 MW are determined. A nonlinear model of the interaction between the beam and RF field is used in which the efficiency is a function of only three normalized variables. By expressing the technological constraints in terms of these variables, permissible design parameters yielding high efficiency operation can be calculated. Constraints that are considered include ohmic heating of the walls, voltage depression of the beam, reduced coupling between the beam and RF field due to beam thickness, and efficiency degradation due to space charge forces within the beam. An analysis of the tradeoffs between current and voltage at the 1 MW level indicates that lower order modes can be utilized at lower voltages, but the constraints based on current limitations are difficult to satisfy. An 80 kV, 29 A design is presented that achieves a total efficiency of 44%. The primary uncertainty of these designs is the severity of competition due to parasitic modes. DOE

N85-28755# Sandia Labs., Albuquerque, N. Mex.
MEASUREMENT AND INTERPRETATION OF ELECTRON ANGLE AT MABE BEAM STOP
Thomas W. L. Sanford, P. Dale Coleman, and James W. Poukey Feb. 1985 35 p refs
(Contract DE-AC04-76DP-00789)
(DE85-008583; SAND-84-1423) Avail: NTIS HC A04/MF A01

The mean angle of incidence at the beam stop of a 60 kA, 7 MV annular electron beam, in the 20 kG guide field of the MABE accelerator, was determined. Radiation dose measured in TLD arrays mounted downstream of the stop is compared with the radiation dose expected using a CYLTRAN Monte Carlo simulation of the electron/photon transport in the stop as a function of incident angles and energies. All radiation profiles measured are well fit, if the electrons are assumed to be incident with a polar angle theta of 15(0) + or - 2(0). A comparison of theta with that expected from the Adler-Miller model, and a MAGIC code simulation of beam behavior at the stop enables the mean transverse beam velocity to be estimated. DOE

N85-28756# Alberta Univ., Edmonton. Nuclear Research Centre.
NUCLEON-NUCLEON PROGRAM AT TRIUMF
L. G. Greeniaus 12 Sep. 1984 4 p refs Presented at the 6th Intern. Symp. on High-Energy Spin Physics, Marseille, 12-19 Sep. 1984
(DE85-900430; TRI-PP-84-106; CONF-8409162-12) Avail: NTIS HC A02/MF A01

TRIUMF has a long history of polarization studies for the nucleon-nucleon system in the energy range between 180 and 520 MeV. The experimental program at TRIUMF continues to be active in this field and important measurements are both in progress and being planned for the near future. In addition, ongoing development efforts to improve the quality and flexibility of the polarized beams and targets available at TRIUMF are described. DOE

N85-28757# Oak Ridge National Lab., Tenn.
MULTIPLE SCATTERING EFFECTS IN LOW ENERGY ALKALI ION SCATTERING: APPLICATION TO THE ANALYSIS OF ADSORBATE ORDERING AND BONDING GEOMETRY
S. H. Overbury 1985 17 p refs Presented at the Symp. on Surface Sci., Obertraun, Austria, 27 Jan. 1985
(Contract DE-AC05-84OR-21400)
(DE85-007575; CONF-850155-1) Avail: NTIS HC A02/MF A01

The occurrence of multiple scattering features in the energy distribution has the disadvantage of making interpretation more complicated but the advantage of increasing the information content available from low energy ion scattering. Steady progress was made in the ability to interpret the scattering from adsorbed atomic overlayers and understanding will increase as more systems are studied. The sensitivity to structure and adsorbate ordering suggest that it may ultimately be possible to analyze the interaction of co-adsorbed atoms and the orientation of small adsorbed molecules. DOE

N85-28758# Brookhaven National Lab., Upton, N. Y.
TRANSVERSE ELECTRON RESONANCE ACCELERATOR
P. I. Csonka 1985 6 p refs Presented at 2nd Intern. Workshop on Laser Acceleration of Particles, Los Angeles, 7 Jan. 1985
(Contract DE-AC02-76CH-00016)
(DE85-008289; BNL-36092; CONF-850128-3) Avail: NTIS

HC A02/MF A01

Transverse (to the velocity, v, of the particles to be accelerated) electron oscillations are generated in high (e.g., solid) density plasmas by either an electromagnetic wave or by the field of charged particles traveling parallel to v. The generating field oscillates with frequency (LC OMEGA) = (LC OMEGA)/sub p/, where (LC OMEGA)/sub p/ is the plasma frequency. As a result of resonance, the electric field, E, inside the microstructures can exceed the generating field E/sub L/. The generating force is proportional to E/sub L/ (as opposed to E/sub L/(2)). Phase matching of particles is possible by appropriate spacing of the microstructures or by a gas medium. The generating beam travels outside the plasma, filamentation is not a problem. The mechanism is relatively insensitive to the exact shape and position of the microstructures. This device contains features of various earlier proposed acceleration mechanisms and may be considered as the limiting case of several of those for small d, T and high E. DOE

N85-28759# Brookhaven National Lab., Upton, N. Y.
ALTERNATING GRADIENT SYNCHROTRON
D. I. Lowenstein 6 Dec. 1984 25 p refs Presented at Workshop on Reliability in Accelerator Operations, Ann Arbor, Mich., 6 Dec. 1984
(Contract DE-AC02-76CH-00016)
(DE85-005950; BNL-35750; CONF-841263-1) Avail: NTIS HC A02/MF A01

With the start of a research and development effort directed towards the Superconducting Super Collider (SSC), it is essential that US industry become involved as soon as possible. The Alternating Gradient Synchrotron (AGS) accelerator complex which presently consists of six different operating accelerators is described in detail. The question of accelerator reliability is addressed. DOE

N85-28760# Brookhaven National Lab., Upton, N. Y.
HEAVY ION PHYSICS AT BNL, THE AGS AND RHIC
D. I. Lowenstein 1985 25 p refs
(Contract DE-AC02-76CH-00016)
(DE85-005951; BNL-35809; CONF-850159-1) Avail: NTIS HC A02/MF A01

The physics of high energy heavy ions range from the more traditional nuclear physics to the formation of new forms of matter. Quantum Chromodynamics (QCD) is the latest, and as of yet, the most successful theory to describe the interaction of quarks and gluons. The nature of the confinement of the quarks and gluons under extremes of temperature and density is one of the compelling reasons for this new physics program at BNL. There are reasons to believe that with collisions of heavy nuclei at energies in the 10 to 100 GeV/amu range a very large volume of approx. 10 fm(3) would be heated to 200-300 MeV and/or acquire a sufficient quark density (5-10 times normal baryon density) so that the entire contents of the volume would be deconfined and the quarks and gluons would form a plasma. The kinematic region for the extant machines and the proposed RHIC are shown. Author

N85-28761# Washington Univ., Seattle. Inst. for Nuclear Theory.
COHERENT STATE DESCRIPTION OF NON-TOPOLOGICAL SOLITONS AND MOMENTUM PROJECTION
M. C. Birse, E. M. Henley, G. Luebeck, and L. Wilets Jun. 1984 11 p refs Presented at Workshop on Solitons in Nucl. and Elementary Particle Phys., Lewes, Del., 2 Jun. 1984
(Contract DE-AC06-81ER-40048)
(DE85-007814; DOE/ER-40048/11-N4; CONF-8406178-4) Avail: NTIS HC A02/MF A01

The solitons studied are localized, static solutions to classical (or semiclassical) nonlinear field equations. Being localized, they do not correspond to momentum eigenstates, even though the field theories solved are translationally invariant. In order to construct states of good momentum, an explicity quantum wave function is needed and not just expectation values of the fields. The techniques discussed provide a wave function which embodies many of the features of the semiclassical (or mean field) approximation. This wave function can be projected onto states of definite momentum and hence can be used to calculate center of mass corrections to soliton properties. Many of the ideas involved were around since the early days of quantum field theory but they have received little application. DOE

N85-28762# Washington Univ., Seattle. Inst. for Nuclear Theory.
ELECTROWEAK INTERACTIONS IN NUCLEI
Ernest M. Henley Jun. 1984 22 p refs Presented at the 8th Course on Nucl. and Subnucl. Degrees of Freedom and Lepton Scattering, Erice, Sicily, 8-20 Apr. 1984
(Contract DE-AC06-81ER-40048)
(DE85-007811; DOE/ER-40048/06-N4; CONF-840435-3) Avail: NTIS HC A02/MF A01

Nuclear and subnuclear degrees of freedom and lepton nucleus scattering were discussed. Electroweak interactions in nuclei were examined. Topics discussed include: introduction to electroweak theory; the Weinberg-Salam theory for leptons; the Weinberg-Salam theory for hadrons-the GIM mechanism; electron scattering as a probe of the electroweak interaction (observation of PV, the weak interaction for nucleons, and parity violation in atoms); and time reversed invariance and electric dipole moments of nucleons, nuclei, and atoms. DOE

N85-28763# Stanford Linear Accelerator Center, Calif.
POSSIBLE INDICATION OF AN A-DEPENDENCE OF R IN DEEP-INELASTIC ELECTRON SCATTERING FROM NUCLEI
J. Gomez Jan. 1985 4 p refs Presented at the American Physical Society Meeting, Santa Fe, N. Mex., 31 Oct. 1984 Prepared in cooperation with American Univ.
(Contract DE-AC03-76SF-00515)
(DE85-008174; SU-SLAC-PUB-3552; CONF-8410222-16) Avail: NTIS HC A02/MF A01

The A dependence of the EMC was studied by measuring differential cross sections for inelastic scattering of electrons. The R for deuterium, He, Al, Fe and Au were measured at Q(2) = 5 (GeV/c) (2) and x = 0.3, 0.5 and 0.7. It is indicated that there is a possible A dependence of R, which could result in large differences among sigma/sup A//sigma/sup d/, F2/sup A//F2/sup d/ and F1/sup A//F1/sup d/. DOE

N85-28764# California Univ., Berkeley. Lawrence Berkeley Lab.
REPORT OF THE WORKING GROUP ON OTHER ACCELERATION SCHEMES
A. M. Sessler Feb. 1985 10 p refs Presented at the 2nd Intern. Workshop on Laser Acceleration of Particles, Los Angeles, 7 Jan. 1985
(Contract DE-AC03-76SF-00098)
(DE85-008447; LBL-19063; CONF-850128-6) Avail: NTIS HC A02/MF A01

The various acceleration schemes were compiled to determine which were covered by the other groups and which were truly other schemes. This discloses the large number of particle driven schemes. Novel schemes are considered; not just laser acceleration schemes. Both lasers and particle beams are a source of high peak power, but particle beams can be an inexpensive source of high average power. It is most natural that the novel acceleration schemes invoke either lasers or particle beams; the necessary trick is to use this power; i.e., to convert the power to a proper accelerating field. DOE

N85-28765# Stanford Linear Accelerator Center, Calif.
PARTICLE PHYSICS: RECENT SUCCESSES AND FUTURE PROSPECTS
Stanley Wojcicki Dec. 1984 11 p refs Presented at the Ann. Meeting of the Div. of Particles and Fields of the Am. Phys. Soc., Santa Fe, N. Mex., 31 Oct. - 3 Nov. 1984
(Contract DE-AC03-76SF-00515)
(DE85-008175; SU-SLAC-Pub-3536; CONF-8410222-17) Avail: NTIS HC A02/MF A01

There is no doubt that as yet there is no ultimate theory of

matter and forces in spite of the remarkable successes of the past decade. The historical background that led us to the present level of understanding, or more specifically to the standard model of particle physics is summarized. Several difficulties with this picture are described and some possible indications of new physics is given and finally prospects for the future are discussed. DOE

N85-28766# Brookhaven National Lab., Upton, N. Y.
STABILITY IN DYNAMICAL SYSTEMS
E. D. Courant, R. D. Ruth (Stanford Linear Accelerator Center, Calif.), and W. T. Weng (Stanford Linear Accelerator Center, Calif.) Aug. 1984 26 p refs Presented at the 3rd Summer School on High Energy Particle Accelerators, Upton, N.Y., 6-16 Jul. 1983
(Contract DE-AC03-76SF-00515)
(DE85-006698; SU-SLAC-Pub-3415; CONF-8307126-6) Avail: NTIS HC A03/MF A01

Some of the basic techniques which can be used to analyze stability in nonlinear dynamical systems, particularly in circular particle accelerators are reviewed. One dimensional systems were emphasized in the examples in order to simply illustrate the general techniques. A review of Hamiltonian dynamics and canonical transformations is presented. Linear equations with periodic coefficients were reviewed using the basic techniques from accelerator theory. To handle nonlinear terms, a canonical perturbation theory was developed. From this was calculated invariants and the amplitude dependence of the frequency. This led to resonances. The cubic resonance was studied in detail by using a rotating coordinate system in phase space. A general isolated nonlinear resonance was considered. The width of the resonance was calculated and the spacing of resonances was estimated in order to use the Chirikov criterion to restrict the validity of the analysis. Finally the resonance equation was reduced to the pendulum equations and the motion on a separatrix was examined. DOE

N85-28767# California Univ., Berkeley. Lawrence Berkeley Lab. Accelerator and Fusion Research Div.
HEAVY ION FUSION ACCELERATOR RESEARCH IN THE US
R. O. Bangerter (LASL, N. Mex.), T. F. Godlove (DOE, Washington, D.C.), W. Herrmannsfeldt (Stanford Linear Accelerator Center, Menlo Park, Calif.), and D. Keefe Sep. 1984 15 p refs Presented at the 10th Intern. Conf. on Plasma Phys. and Controlled Nucl. Fusion Res., London, 12-19 Sep. 1984
(Contracts DE-AC03-76SF-00515; DE-AC03-76SF-00098; W-7405-ENG-48)
(DE85-008465; LBL-18235; UCRL-91333; CONF-840910-24) Avail: NTIS HC A02/MF A01

Three new developments took place in the heavy ion fusion accelerator research (HIFAR) program. The program's goal is to establish a data base in accelerator physics and technology which gives an accurate assessment of the potential of heavy ion fusion. It was decided to concentrate the experimental program on the development of multiple beam induction linacs. New beam transport experiments over a large number of quadrupole elements show that stable beam propagation occurs for significantly higher beam currents than was thought possible. Design calculations show that a test accelerator of modest size and cost can come within a factor of three of testing which is almost all of the physics and technical issues appropriate to a power-plant driver. DOE

N85-28768# Virginia Univ., Charlottesville. Dept. of Physics.
SPECTROSCOPY OF SURFACE ADSORBED MOLECULES
Progress Report, 1 May 1984 - 31 Apr. 1985
Robert V. Coleman 1985 25 p
(Contract DE-FG05-84ER-45072)
(DE85-009452; DOE/ER-45072/T1) Avail: NTIS HC A02/MF A01

The adsorbtion spectral molecules onto surfaces were measured. Topics covered include: the tunneling microscope, improvements in barrier height analysis for tunneling microscope and fabricated doped junctions, zero bias anomalies in doped tunnel junctions, tunnel barrier modifications with vaporated metal layers onto AlOx, and photoelectron spectroscopy studies of barriers and doped barriers. DOE

N85-28769# Brookhaven National Lab., Upton, N. Y.
LARGE, ENERGETIC CLUSTER IMPACTS ON SURFACES
M. Matthew, R. J. Beuhler, M. Ledbetter, and L. Friedman 1985 44 p refs Presented at the 5th Intern. Workshop on Inelastic Ion-Surface Collisions, Gold Canyon Ranch, Ariz., 8 Jan. 1985 Submitted for publication
(Contract DE-AC02-76CH-00016)
(DE85-006559; BNL-35813; CONF-850154-1) Avail: NTIS HC A03/MF A01

The competition between sputtering or evaporative cooling and cooling by thermal conduction of thermal spikes produced by cluster ion impact on surfaces was investigated by study of the morphology of craters or holes produced in the surfaces using techniques of transmission electron microscopy. Protonated water molecule clusters containing as many as 150 water molecules accelerated to energies as high as 300,000 volts, were used and their impact on thin carbon surfaces are presented. The clusters are considered as species which are intermediate between atomic and small molecule projectiles which transfer energy on impact and penetration in processes that can be modeled by two body interactions with energy losses given by stopping power theory, and macromolecular projectiles which compress solid targets and transfer energy by generation of shock waves and continuum phenomena. Threshold cluster sizes and energies for production of the latter type process are determined from observation of energy transfer processes. Craters or holes as small as 20 to 30 A in diameter are produced in thin carbon films by 50 molecule protonated water cluster ions. The morphology of these craters and holes and larger ones produced by larger cluster ions provide direct experimental evidence for the formation of thermal spikes. The technique provides a method of permanently altering surface structures. DOE

N85-28770# Brookhaven National Lab., Upton, N. Y.
EXTENSION OF THE CONSISTENT Q FORMALISM TO ODD-A NUCLEI IN THE W-Pt REGION
D. D. Warner, P. Vanlsacker (Inst. voor Nucleaire Wetenschappen, Gent, Belgium), J. Jolie (Inst. voor Nucleaire Wetenschappen, Gent, Belgium), and A. M. Bruce (Manchester Univ., England) 1984 13 p refs Presented at the Intern. Symp. on Nucl. Shell Model, Philadelphia, 31 Oct. - 3 Nov. 1984 Sponsored in part by Nationaal Fonds voor Wetenschappelijk Onderzoek and Inst. tot Aanmoediging van het Wetenschappelijk Onderzoek
(DE85-008284; BNL-35987; CONF-8410144-11) Avail: NTIS HC A02/MF A01

It is shown that the approach of the Consistent Q Formalism, which has proved successful in the Interacting Boson Model description of even-even nuclei, can be extended to odd A nuclei within the framework of the Interacting Boson-Fermion Model. The proposed method describes the transition between the SU(3) and O(6) symmetry limits of the U(6/12) boson fermion group, and can be applied to the odd neutron W, Os, Pt nuclei. As in the even-even case, a number of parameter-free predictions emerge for the transitional region concerning energies, B(E2) values and also single particle structure factors, and some of these are compared to existing data for the odd Os nuclei. DOE

N85-28771# Brookhaven National Lab., Upton, N. Y.
ELEMENTARY PARTICLE THEORY
William J. Marciano Dec. 1984 62 p refs Presented at the 3rd Ann. Summer School on High Energy Accelerators, Upton, N.Y., 6-16 Jul. 1983 Submitted for publication
(Contract DE-AC02-76CH-00016)
(DE85-006803; BNL-35788; CONF-8307126-4) Avail: NTIS HC A04/MF A01

The present state of the art in elementary particle theory is reviewed. Topics include quantum electrodynamics, weak interactions, electroweak unification, quantum chromodynamics, and grand unified theories. DOE

N85-28772# Los Alamos Scientific Lab., N. Mex.
INCORPORATION OF MONTE CARLO ELECTRON INTERFACE STUDIES INTO PHOTON GENERAL CAVITY THEORY
Y. S. Horowitz (Hawshaw/Filtrol Partnership), M. Moscovitch (Hawshaw/Filtrol Partnership), H. Hsu, E. Kearsley (Dept. of the Navy, Bethesda, Md.), and J. M. Mack 1985 16 p refs Presented at the 9th Intern. Symp. on Microdosimetry, Toulouse, 20-24 May 1985
(Contract W-7405-eng-36)
(DE85-007674; CONF-850506-1; LA-UR-85-639) Avail: NTIS HC A02/MF A01

Electron Monte Carlo calculations using CYLTRAN and a new PHSECE (Photon Produced Secondary Electrons) technique were carried out to estimate electron fluences and energy deposition profiles near LiF/Al and LiF/Pb material interfaces undergoing Co-60 gamma irradiation. Several interesting and new features emerge: (1) Although the build-up of the secondary electron fluences at the interfaces of the irradiated media is approximately exponential, the value of the electron mass fluence build-up coefficient, (BETA) is not equal to the electron mass fluence attenuation coefficient, (BETA)/sub A. (2) The attenuation of the gamma-generated electron fluence at the cavity-medium interfaces, (BETA)/sub A, is strongly dependent on the Z of the adjacent material, and (3) for LiF/Pb there is a significant intrusion energy deposition mode arising from side-scattering in the wall (Pb) material. DOE

N85-28773# California Univ., Berkeley. Lawrence Berkeley Lab. Dept. of Physics.
PROPOSAL FOR THE SYSTEMATIC NAMING OF MESONS AND BARYONS
F. C. Porter (California Inst. of Tech., Pasadena), J. J. Hernandez (CERN), L. Montanet (CERN), M. Roos (Helsinki Univ.), N. A. Toernqvist (Helsinki Univ.), R. M. Barnett, R. N. Cahn, G. Gidal, A. Rittenberg, T. G. Trippe et al Oct. 1984 10 p Presented at the Am. Phys. Soc. Meeting, Los Alamos, N. Mex., 31 Oct. 1984
(Contract DE-AC03-76SF-00098; Grant NSF PHY-83-18358)
(DE85-008453; CONF-8410222-18; LBL-18834) Avail: NTIS HC A02/MF A01

Twenty years ago, the Particle Data Group adopted a systematic naming convention for baryons: the symbols N, (DELTA), (LAMBDA), (SIGMA), (XI), and (UC OMEGA) were to identify the isospin and strangeness. The mesons, by contrast, have become an alphabet soup of uninformative names - theta, iota, xi, zeta, g sub T, g sub s, H, E, delta, h, g, r, kappa, etc., and in some cases identical names are used for mesons with different quantum numbers (A, B, and D). Furthermore, experimentalists are now discovering baryons that contain heavy quarks. Systematic naming conventions both for mesons and for baryons with heavy quarks are considered. DOE

N85-28774# Interuniversitair Reactor Instituut, Delft (Netherlands). Stralingsbeschermingsdienst.
THEORETICAL BASIS FOR THE DETERMINATION OF THE CONCENTRATION OF RADON DECAY PRODUCTS IN AIR FROM THE ACTIVITY OF A PARTICULATE AIR SAMPLE
W. F. Passchier Aug. 1983 10 p refs
(IRI-190-83-07) Avail: NTIS HC A02/MF A01

Linear relationships between the radon decay count rate at a certain time, or the number of counts in a certain time interval, and the decay product supply rates during the sampling are derived. If m measurements (m > or = n) are obtained, the supply rates of the n decay products can be derived by solving a set of m linear equations. If the volume rate of sampling and the retention efficiency of the filter used for sampling is known, the concentrations can be computed from the supply rates. Author (ESA)

N85-28775# Interuniversitair Reactor Instituut, Delft (Netherlands). Werkgroep Stralingshygiene en Dosimetrie.
MODEL COMPUTATIONS OF RADON, AND RADON DECAY PRODUCT, CONCENTRATIONS IN AN OPEN SYSTEM; THE HEWLETT-PACKARD 41C PROGRAM RNSS, VERSION 02
W. F. Passchier Sep. 1983 18 p Revised
(IRI-190-83-12; IRI-190-81-05-Rev) Avail: NTIS HC A02/MF A01

Expressions for the time dependence of the nuclide concentrations of a decay series in an open system are presented. These expressions simplify considerably in the steady state situation. For the computation of steady state concentrations of radon and its short-lived decay products, an HP-41C computer program is described. The potential alpha energy concentration and the equilibrium factor are also calculated. The program is based on a model that takes into account the supply of all nuclides by the ventilation air, the emanation of radon from the surface of the system, the removal of all nuclides by the ventilation air, the removal of the short-lived decay products by deposition, and radioactive decay. Two examples of the program execution are given. The program source is listed. Author (ESA)

N85-28776# National Inst. voor Kernfysica en Hoge Energieysica, Amsterdam (Netherlands).
NEW EXPERIMENTAL RESULTS IN TWO PHOTON PHYSICS
H. P. Paar Dec. 1984 14 p refs
(NIKHEF-H/84-16) Avail: NTIS HC A02/MF A01

Experimental results in two photon physics total cross sections, the ratio of hadron to muon production, structure functions in inelastic lepton-photon scattering, and exclusive resonance production are discussed. It is shown that these processes are well described by QCD, augmented by quark parton model and vector meson dominance notions. Aspects of the data for exclusive resonance production may be interpreted as evidence for glueballs. Author (ESA)

N85-28777# National Inst. voor Kernfysica en Hoge Energieysica, Amsterdam (Netherlands).
[ACTIVITIES REPORT IN NUCLEAR PHYSICS AND HIGH ENERGY PHYSICS] Annual Report, 1983
1984 76 p refs In DUTCH
(JF40026) Avail: NTIS HC A05/MF A01

Experiments with a super proton synchroton, proton-antiproton reactor, the Low Energy Antiproton Ring at CERN, the electron-positron storage ring at DESY, and the e+e- reactor at SLAC were performed. Research on the electro-excitation of nuclei, pion and muon physics, the sigma-omega model, and radiochemistry was performed. Author (ESA)

N85-28178# Joint Publications Research Service, Arlington, Va.
PROTON INDUCED X-RAY EMISSION METHOD, ITS APPLICATION IN ANALYTICS
Gyula Szabo *In its* East Europe Rept.: Sci. and Technol. (JPRS-ESA-85-017) 2 May 1985 p 21-23 Transl. into ENGLISH from Finomech., Mikrotech. (Budapest), no. 6, Jun. 1984 p 161-164 Presented at the Seminar on Vacuum Technol. and Anal., Budapest, 20 Feb. 1984 (For primary document see N85-28177 17-31)
Avail: NTIS HC A05/MF A01

73 NUCLEAR AND HIGH-ENERGY PHYSICS

Includes elementary and nuclear particles; and reactor theory.

For space radiation see *93 Space Radiation.*

N85-28778# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
A PROPORTIONAL-PLUS-INTEGRAL CONTROLLER FOR A PARTICLE BEAM WEAPON M.S. Thesis
W. J. Moose Dec. 1984 109 p
(AD-A153213; AFIT/GA/ENG/84D-3) Avail: NTIS HC A06/MF A01 CSCL 15/3

The goal of this thesis is to design a proportional-plus-integral (PI) controller, for use with the Meer filter, to control a particle beam weapon. The device used to measure the beam produces

a low signal rate, the Meer filter is used to produce an estimate of the beam position. A type-1, proportional-plus-integral controller is designed using LOG assumptions and dynamic programming to solve the cost function. A sensitivity analysis is performed to determine the system sensitivity to different parameters. A performance analysis is also performed to demonstrate the system robustness to unmodelled errors. The results of these analyses are compared to a type-0, proportional gain controller. In addition the PI controllers ability to regulate to a non-zero setpoint is demonstrated. GRA

N85-28779# Stanford Linear Accelerator Center, Calif.
HEAVY QUARK PRODUCTION PROCESSES IN QCD
Stanley J. Brodsky and John F. Gunion (California Univ., Davis) Dec. 1984 9 p refs Presented at the 12th SLAC Summer Inst. on Particle Phys., Stanford, Calif., 23 Jul. - 3 Aug. 1984
(Contract DE-AC03-76SF-00515)
(DE85-007240; SU-SLAC-PUB-3527; CONF-8407112-2) Avail: NTIS HC A02/MF A01

Two novel effects in QCD, each of which acts to enhance the production of heavy quark and supersymmetric particles beyond what is conventionally expected from gluon fusion were identified. Both effects are present in QED, but are compounded in QCD because of the increased number of diagrams and the much larger coupling constant. The intrinsic charm quark distribution in the nucleon could account for the observed enhancements of the charm structure function at large x and features of the charm production data. Prebinding distortion of the fusion cross section is, however, likely to be significant for the production at low /sub T/ of all particles containing heavy colored constituents. At this stage the QCD calculations are highly model dependent although they agree with the general properties which can be inferred from the operator product expansion in the heavy quark mass. E.A.K.

N85-28780# Stanford Linear Accelerator Center, Calif.
PHYSICS OF (VERY) HIGH ENERGY e(+)-e(-) COLLIDERS
M. E. Peskin Oct. 1984 12 p refs Presented at 4th Intern. Conf. on Phys. in Collision, Santa Cruz, Calif., 22 Aug. 1984
(DE85-008177; SU-SLAC-Pub-3496; CONF-8408141-3) Avail: NTIS HC A02/MF A01

The physics capabilities of e(+)e(-) colliders of hundred GeV to TeV center-of-mass energies is reviewed. The physics of symmetry breaking in the weak interactions is emphasized. The question of the mass spectrum of quarks and leptons is discussed. Another question discussed is the origin of the weak boson masses, i.e., the mechanism by which SU(2)XU(1) is spontaneously broken. DOE

N85-28781# Stanford Linear Accelerator Center, Calif.
EXPERIMENTAL METHODS OF HEAVY QUARK DETECTION
T. Himel Nov. 1984 36 p refs Presented at the 12th SLAC Summer Inst. on Particle Phys., Stanford, Calif., 23 Jul. - 3 Aug. 1984
(Contract DE-AC03-76SF-00515)
(DE85-006316; SU-SLAC-PUB-3510; CONF-8407112-1) Avail: NTIS HC A03/MF A01

By comparing how b and c were observed we saw that the heavier quark was more difficult to detect. For various reasons the signal was smaller and the signal-to-noise worse. This trend is expected to continue when searching for the still heavier top quark. In fact many detection techniques which worked well for bottom and charm are not viable for top. For masses less than about 60 GeV/c(2) top should be visible at the CERN S anti ppS. For larger masses the higher energy of the Fermilab Tevatron will be necessary. At both machines semileptonic decays are the most promising tag. There are background rejectioon techniques which should result in a fairly clean signal. As there are many possible background sources it is important to carefully estimate the residual background from the data itself. At e(+)e(-) machines top will be copiously produced in Z(0) decays if M/sub t/ < M/sub Z(0)//2. In this case it is possible to estimate its mass and study its decay modes. DOE

N85-28782# Chicago Univ., Ill.
THEORETICAL STUDIES OF HIGH ENERGY PHENOMENON: ANALYSIS OF MODELS OF CP AND T VIOLATION Progress Report, 1 May 1983 - 30 Apr. 1985
Robert G. Sachs Dec. 1984 68 p refs
(Contract DE-AC02-80ER-10587)
(DE85-007455; DOE/ER-10587/3) Avail: NTIS HC A04/MF A01

The possibility that topological or other complexities associated with some fundamental theories of particle physics could lead to apparent (phenomenological) deviations from unitarity, and therefore from CPT invariance, in the weak decays of K mesons was considered. It was shown that the observed CP-violation could arise as a result of such deviations. The charge asymmetry in certain hadronic decays of the B(0)-anti B(0) system was shown to provide a relatively simple measure of the phase of the Kobayashi-Maskawa matrix. It was shown that severe limits can be placed on the magnetic moment of the (SIGMA) (-) in the quark model even when the quark moments are permitted an anomaly of up to 10%. DOE

N85-28783# Washington Univ., Seattle. Nuclear Physics Lab.
HIGH ENERGY GAMMA RAYS FROM COMPLEX PARTICLE COLLISIONS
K. A. Snover 1984 17 p refs Presented at the Capture Gamma-Ray Spectroscopy Conf., Knoxville, Tenn., 10 Sep. 1984
(Contract DE-AC06-81ER-40048)
(DE85-007871; DOE/ER-40048/113-L4; CONF-840906-20) Avail: NTIS HC A02/MF A01

High energy (GAMMA)-rays (E/sub (GAMMA)/ approx. 10 to 30 MeV), from the decay of Gaint Dipole Resonance built on excited nuclear states (e.s.-GDRs) are a common feature of all energetic nuclear collisions. Current results indicate that for bombarding energies below 5 to 6 MeV per nucleon the statistical emission of high energy (GAMMA)-rays predominates in complex particle collisions. Statistical GDR properties have now been studied over a wide range of mass, energy and angular momentum. Recent results include: (1) in light compound nuclei considerably broadened e.s.-GDRs are observed, with strengths that indicate relatively pure compound nuclei isospin, (2) in medium mass nuclei (A approx. 60 to 80) e.s.-GDRs are found with substantially reduced strength (approx. < 0.5 of the classical dipole sum rule) and (3) in rare-earth deformed nuclei a splitting of e.s.-GDRs is apparent, indicating the persistence of deformation at elevated temperature. At higher bombarding energies (6 to 9 MeV per nucleon) for (3)He and (4)He strong enhancements are seen for E/sub (GAMMA)/ approx. > 15 MeV, due to nonstatistical effects. DOE

74 OPTICS

Includes light phenomena.

N85-28784 Department of the Air Force, Washington, D.C.
OPTICAL SYSTEM FOR MEASURING SHADOWGRAPH DATA Patent
E. O. Cole and V. H. Yeterian, inventors (to Air Force) Issued 19 Feb. 1985 11 p Supersedes AD-D009952
(AD-D011642; US-Patent-4,500,206; US-Patent-Appl-SN-434671; US-Patent-Class-356-376) Avail: US Patent and Trademark Office CSCL 17/8

An optical system for measuring azimuth and elevation angular data for making a shadowgraph of an object under study is discussed. The system includes a pair of scaled assemblies which are secured together perpendicular to each other, with each of the scaled assemblies having degree markings thereon. An object under study, such as a scale model of an aircraft, is positioned within an imaginary sphere formed by the two scaled assemblies. Azimuth and elevation angular measurements are then obtained by the use of laser systems as the model aircraft is rotated within the imaginary sphere of the ring assemblies. GRA

N85-28785*# Virginia Univ., Charlottesville.
INVESTIGATION OF SEMICONDUCTOR CLAD OPTICAL WAVEGUIDES Final Report
T. E. Batchman and Richard F. Carson Mar. 1985 76 p refs
(Contract NAG1-17702)
(NASA-CR-175870; NAS 1.26:175870; UVA/528207-EE85-103) Avail: NTIS HC A05/MF A01 CSCL 20F

A variety of techniques have been proposed for fabricating integrated optical devices using semiconductors, lithium niobate, and glasses as waveguides and substrates. The use of glass waveguides and their interaction with thin semiconductor cladding layers was studied. Though the interactions of these multilayer waveguide structures have been analyzed here using glass, they may be applicable to other types of materials as well. The primary reason for using glass is that it provides a simple, inexpensive way to construct waveguides and devices. G.L.C.

N85-28786*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
INCIDENT BEAM POLARIZATION FOR LASER DOPPLER VELOCIMETRY EMPLOYING A SAPPHIRE CYLINDRICAL WINDOW
James A. Lock (Clevelend State Univ.) and Harold J. Schock Jun. 1985 25 p refs
(NASA-TM-87064; E-2316-1; NAS 1.15:87064) Avail: NTIS HC A02/MF A01 CSCL 20F

For laser Doppler velocimetry studies employing sapphire windows as optical access ports, the birefringency of sapphire produces an extra beam intersection volume which serves to effectively smear the acquired velocity flow field data. It is shown that for a cylindrical window geometry, the extra beam intersection volume may be eliminated with minimal decrease in the fringe visibility of the remaining intersection volume by suitably orienting the polarizations of the initial laser beams. For horizontally incident beams, these polarizations were measured at three intersection locations within the cylinder. It was found that the measured polarization angles agreed with the theoretical predictions. Author

N85-28787# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
CONSTRUCTION AND ANALYSIS OF A PRIZ SPATIAL LIGHT MODULATOR EXHIBITING DYNAMIC IMAGE SELECTION M.S. Thesis
D. M. Shields Dec. 1984 83 p
(AD-A152318; AFIT/GEO/ENP/84D-4) Avail: NTIS HC A05/MF A01 CSCL 20/6

A PRIZ electrooptic spatial light modulator exhibiting dynamic image selection (current-conducting PRIZ) was constructed, demonstrated, and analyzed. The current-conducting PRIZ was constructed by vacuum depositing transparent chromium electrodes on the large faces (1 sq cm) of a thin (0.5mm) slice of (111) cut Bismuth Silicon Oxide (Bi12SiO20 or BSO). Dynamic image selection was demonstrated by writing a moving image into the device with an Argon ion laser and observing the image reproduced by a circularly polarized HeNe laser readout beam. This experiment verifies the dynamic image selection effect with a device constructed outside of the Soviet Union, an accomplishment not previously reported. The BSO material was analyzed and found to exhibit optical activity and refractive index values similar to other American grown material. The conductivity and absorption coefficients differed significantly from the published results, being higher and lower, respectively. The experimental device exhibits directional filtering in agreement with published theory and also exhibits optical memory times of up to 20 minutes. GRA

N85-28788# University of Southern California, Los Angeles. Electronic Sciences Lab.
STUDIES OF OPTICAL-BEAM PHASE-CONJUGATION BY NONLINEAR REFRACTION Annual Scientific Report, 3 Dec. 1982 - 2 Dec. 1983
R. W. Hellwarth 31 Dec. 1984 11 p
(Contract F49620-83-C-0045)
(AD-A152865; AFOSR-85-0283TR) Avail: NTIS HC A02/MF A01 CSCL 20/6

Studies of optical beam phase conjugation by a variety of physical processes and their application to spectroscopy, gyroscopy, and optical information processing is continued. GRA

N85-28789# Aerospace Corp., El Segundo, Calif. Electronics Research Lab.
OPTICAL WAVEGUIDE CHARACTERIZATION USING GRATING COUPLERS
D. G. Heflinger 15 Dec. 1984 22 p
(Contract F04701-83-C-0084)
(AD-A153063; TR-0084A(5925-04)-1; SD-TR-85-08) Avail: NTIS HC A02/MF A01 CSCL 09/1

Optical waveguides of GaAlAs were experimentally investigated using tthe grating coupler. A convenient measurement to reference input-coupling angles to the normal is described. This referencing capability enables the accurate characterization of a single mode waveguide. The measurement is applicable to the determination of the effective refractive index of quaternary waveguides, and thus could assist in the fabrication of GaInAsP/InP distributed Bragg reflector lasers. GRA

N85-28790# Department of the Air Force, Washington, D.C.
SPATIAL LIGHT MODULATOR HAVING A CAPACITIVELY COUPLED PHOTOCONDUCTOR Patent Application
D. Armitage, inventor (to Air Force) Filed 6 Mar. 1985 13 p
(AD-D011646; US-Patent-Appl-SN-708926) Avail: NTIS HC A02/MF A01 CSCL 20/6

The present invention relates generally to the field of optical signal processing apparatus, and more specifically to a spatial light modulator of simplified construction and improved performance. Two-dimensional spatial light modulators are devices which allow control of an optical wavefront for processing or imaging operations. These devices, often referred to as light valves in the literature, have potential for application in large screen display systems as well as in optical data processing systems. One basic form of spatial light modulator comprises a photosensitive semiconductor substrate or wafer, a light blocking layer, a dielectric mirror and an electro-optic crystal (which may in some applications be a liquid crystal), arranged in a sandwich-like composite structure, and having a voltage applied thereacross. The photosensitive semiconductor substrate is often a photodiode formed by depositing p-type silicon substrate and applying a reverse biasing potential thereacross. GRA

N85-28791# Department of the Air Force, Washington, D.C.
SYSTEM OF WHITE-LIGHT DENSITY PSEUDOCOLOR ENCODING WITH THREE PRIMARY COLORS Patent Application
F. T. S. Yu, inventor (to Air Force) Filed 21 Feb. 1985 24 p
(AD-D011651; US-Patent-Appl-SN-704109) Avail: NTIS HC A02/MF A01 CSCL 20/6

This invention relates generally to a method/system of white-light density pseudocolor encoding and, more particularly to a technique of generating density pseudocolor encoding with three primary colors using white-light optical processor. The present invention overcomes the problems encountered in the past techniques of pseudocolor encoding as set forth in detail hereinabove by providing a technique of generating density pseudocolor encoding with three primary colors using a white-light optical processor. A process/system of generating density pseudocolor encoding with three primary colors using a white-light optical processor. Spatial encodings are made with positive, negative and product positive and negative photographic image transparencies and the pseudocoloring is obtained by color filtering of the smeared Fourier spectra. The technique is extremely versatile and economical to operate such that it offers a wide range of applications. Since coherent sources are not utilized, the color coded images are free from coherent artifact noise. Consequently, the system incorporating the method of the present invention can be computer controlled and is extremely effective in perceiving optical images as well as being extremely economical and reliable. GRA

N85-28792# Sandia Labs., Albuquerque, N. Mex.
RECENT ADVANCES IN OPTICAL MEASUREMENT METHODS IN PHYSICS AND CHEMISTRY
J. B. Gerardo 1985 9 p refs Presented at the Southwest Conf. on Optics, Albuquerque, N. Mex., 4 Mar. 1985
(Contract DE-AC04-76DP-00789)
(DE85-008695; CONF-850345-5) Avail: NTIS HC A02/MF A01

Progress being made in the development of new scientific measurement tools based on optics and the scientific advances made possible by these new tools is impressive. In some instances, new optical based measurement methods have made new scientific studies possible, while in other instances they have offered an improved method for performing these studies, e.g., better signal to noise ratio, increased data acquisition rate, remote analysis, reduced perturbation to the physical or chemical system being studied, etc. Many of these advances were made possible by advances in laser technology - spectral purity, spectral brightness, tunability, ultrashort pulse width, amplitude stability, etc. - while others were made possible by improved optical components - single made fibers, modulators, detectors, wavelength multiplexes, etc. DOE

N85-28793# Sandia Labs., Albuquerque, N. Mex.
DOE/SANDIA POINT-FOCUS CONCENTRATOR PROGRAM, DRAFT
T. R. Mancini 1985 16 p refs Presented at the Solar Thermal Research Program Ann. Conf., Denver, 20 Feb. 1985
(Contract DE-AC04-76DP-00789)
(DE85-008209; SAND-85-05380; CONF-850252-1-Draft) Avail: NTIS HC A02/MF A01

Point-focus solar concentrators were developed. This program is reviewed with primary emphasis on the innovative concentrators presently being designed. DOE

N85-28794*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
SPECIAL TOPICS IN INFRARED INTERFEROMETRY [BESONDERE THEMEN DER INFRAROT-INTERFEROMETRIE]
Rudolf A. Hanel Jan. 1985 42 p refs In GERMAN Prepared in cooperation with Max-Planck Inst. fuer Physik und Astrophysik
(NASA-TM-87472; NAS 1.15:87472; MPE-189; ISSN-0340-8922) Avail: NTIS HC A03/MF A01 CSCL 20F

Topics in IR interferometry related to the development of a Michelson interferometer are treated. The selection and reading of the signal from the detector to the analog to digital converter is explained. The requirements for the Michelson interferometer advance speed are deduced. The effects of intensity modulation on the interferogram are discussed. Wavelength and intensity calibration of the interferometer are explained. Noise sources (Nyquist or Johnson noise, phonon noise), definitions of measuring methods of noise, and noise measurements are presented. Author (ESA)

N85-28795# Center for Mathematics and Computer Science, Amsterdam (Netherlands). Dept. of Applied Mathematics.
CHAOS AND ORDER IN AN OPTICAL RING CAVITY
H. A. Lauwerier and M. B. vanderMark (Amsterdam University) Nov. 1984 20 p refs Submitted for publication
(CWI-AM-R8416; B8478809) Avail: NTIS HC A02/MF A01

Bifurcation in a two-dimensional iterative map which can be written in complex coordinates z and z bar in the form: $z' = A + Bz \exp i(|z|^2 - beta)$ is considered. The complex coordinate z is an electric field vector, A is the amplitude of the incoming wave, B measures the dissipation of the electric energy and beta is a mistuning parameter. The mapping is considered using the usual techniques of two-dimensional maps. The parameter B determines whether the map is Hamiltonian ($B=1$), i.e., measure preserving, or dissipative ($B<1$). Various plots are given showing the chaotic behaviour of the map, periodic points, continuous invariant curves, isolated structures, and strange attractors. Author (ESA)

N85-28796# National Aerospace Lab., Amsterdam (Netherlands). Space Div.
LIGHT SCATTERING BY LEAF LAYERS WITH APPLICATION TO CANOPY REFLECTANCE MODELING: THE SCATTERING BY ARBITRARILY INCLINED LEAVES (SAIL) MODEL
W. Verhoef 2 Feb. 1984 33 p refs Submitted for publication
(NLR-MP-84011-U; B8561057) Avail: NTIS HC A03/MF A01

The scattering and extinction coefficients of the Scattering by Arbitrarily Inclined Leaves (SAIL) canopy reflectance model are derived for a fixed arbitrary leaf inclination angle and a random leaf azimuth distribution. The SAIL model includes the Suits uniform model as a special case. Agronomic variables like the leaf area index and the leaf inclination distribution function are input parameters. It provides more realistic angular profiles of the directional reflectance as a function of the view angle or the solar zenith angle than the Suits model. Author (ESA)

N85-28154# Joint Publications Research Service, Arlington, Va.
PERFORMANCE EVALUATION OF FIBER-OPTIC CONVERTERS Abstract Only
M. A. Farakhutdinova and N. T. Suleymanov *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-85-004) 15 May 1985 p 78-79 Transl. into ENGLISH from Optiko-Mekhan. Prom. (Leningrad), no. 7, Jul. 1984 p 14-16 (For primary document see N85-28142 17-31)
Avail: NTIS HC A06/MF A01

75 PLASMA PHYSICS

Includes magnetohydrodynamics and plasma fusion.
For ionospheric plasmas see *46 Geophysics*. For space plasmas see *90 Astrophysics*.

N85-28797 United Kingdom Atomic Energy Authority, Harwell (England). Nuclear Physics Div.
TIME-INTEGRATED YIELD FOR THE JOINT EUROPEAN TORUS (JET), APRIL - SEPTEMBER 1984
P. Mills-Baker Feb. 1985 42 p refs
(AERE-M-3449) Copyright. Avail: Issuing Activity

An experimental investigation of the suitability of various foils for use in an activation system designed to monitor the total neutron flux emitted from plasmas at JET is described. Both the d-d phase (2.5 MeV neutrons) and the d-T phase (14 MeV neutrons) have been considered. Some experimental problems which had to be overcome with the gamma-ray detector and the multi-channel analyzer are described. Finally, a list of foils with different energy thresholds and neutron yield sensitivities is recommended. Author

N85-28798*# National Aeronautics and Space Administration, Washington, D. C.
STUDY OF A CONSTRICTED ELECTRIC ARC COOLED BY TRANSPIRATION
Ernst R. G. Eckert May 1985 25 p refs Transl. into ENGLISH of "Etudes sur un arc electrique constricte refroidi par exsudation" from Conf. Proceedings, 1967 p 193-200 Presented at 7th Intern. Conf. on States of Matter Under the Extreme Effects of Very High and Very Low Pressures, Paris, 4-8 Apr. 1967 Original language document previously announced in IAA as A68-38749 Transl. by Scientific Translation Service, Santa Barbara, Calif. Original document prepared by Minnesota Univ., Minneapolis
(Contract NASw-4004)
(NASA-TM-77846; NAS 1.15:77846) Avail: NTIS HC A02/MF A01 CSCL 20I

A description is given of an experiment in which high plasma temperatures are obtained in an arc furnace cooled by transpiration. The apparatus used in the experiment is described. The container consists of insulated disks cooled by water. The electric arc is produced in the container from the cathode to the annular anode, and the hot gas flows across in the axial direction. A graph is presented in which the maximum temperature of the gas, the temperature of the internal surface of the container wall, and the power of the electric field are plotted as functions of the velocity

of the passage and the electric energy absorbed by unit of length of a constricted arc cooled by transpiration. R.J.F.

N85-28799# Materials Research Labs., Melbourne (Australia).
EXAMINATION OF A METHOD FOR PREDICTING THE PROPERTIES OF RAILGUN PLASMAS
V. Kowalenko Apr. 1985 33 p refs
(AR-004-322; MRL-R-960) Avail: NTIS HC A03/MF A01

In his study of ablation-dominated arcs, which are found in fuses, lightning arrestors and circuit breakers, the expression material function is used to denote the two types or classes of properties of most interest when studying plasma mixtures. These distinct types are: firstly, thermodynamic properties, which include such physical properties as the density, specific heat, enthalpy, heat capacity, molecular weight and speed of sound, and secondly transport properties, which include the electrical conductivity and the coefficients of viscosity and thermal conductivity. Many of the thermodynamic properties have not been considered to be particularly relevant in previous studies of the plasma armature in electromagnetic railguns. Of the transport properties, the physical quantity of primary interest to railgun workers is the electrical conductivity. The remaining two transport properties have not been considered to be important in previous studies of the plasma in a railgun. G.L.C.

N85-28800# National Materials Advisory Board, Washington, D.C.
PLASMA PROCESSING OF MATERIALS Final Report, Feb. 1983 - Feb. 1985
M. C. Flemings, D. Apelian, N. Jarrett, B. H. Kear, and C. J. Mogab 22 Feb. 1985 180 p
(Contract MDA903-82-C-0434)
(AD-A152398; NMAB-415) Avail: NTIS HC A09/MF A01 CSCL 20/9

This report contains an assessment of recent developments in processing materials through the use of plasma technology. Advances in this field in foreign countries are discussed and the potentials for this type of processing relative to selected materials from the standpoints of cost-effectiveness and technical viability made. It addresses thermal plasma melting and remelting technology, extracting and refining technology, plasma deposition, thermal plasma synthesis and consolidation and processing using low-pressure nonequilibrium plasmas. Conclusions and recommendations are made for potential research and development projects in each of the technologies studied. GRA

N85-28801# Naval Research Lab., Washington, D. C.
A NUMERICAL SOLUTION TECHNIQUE FOR MULTITEMPERATURE PLASMA HYDRODYNAMICS
C. R. DeVore and J. H. Gardner 11 Apr. 1985 26 p
(AD-A152701; AD-E301651; NRL-MR-5540) Avail: NTIS HC A03/MF A01 CSCL 20/9

We describe a numerical technique for the solution of the equations of multitemperature plasma hydrodynamics in a finite-difference formulation. A key feature of the algorithm is that it is locally mass, momentum, and energy conservative, and therefore is particularly useful for problems which require an accurate description of each of the constitutent fluids in the presence of shock waves. We present explicit formulae for solving the equations for a simple two-temperature plasma, and discuss the extension of the algorithm to more complex multitemperature plasma models. We also summarize some results from a two-temperature laser-matter interaction simulation as an illustration of the performance of the algorithm. GRA

N85-28802# Illinois Univ., Urbana. Fusion Studies Lab.
RESTRIKE PARTICLE BEAM EXPERIMENTS ON A DENSE PLASMA FOCUS. OPENING SWITCH RESEARCH ON A DENSE PLASMA FOCUS Final Report, 30 Sep. 1979 - 29 Sep. 1984
G. Gerdin Jun. 1985 65 p
(Grant AF-AFOSR-Q121-79)
(AD-A152991; FSL-181; AFOSR-85-0279TR) Avail: NTIS HC A04/MF A01 CSCL 20/8

Research on this grant has focused on plasma focus experiments in the areas of particle beam generation and as a potential repetitive opening switch. In pursuing the former unique diagnostic tools were developed to measure the scaling of particle beam current and energy for both the electron and ion beams generated by the device. Simultaneous measurements of the energy spectra for both the electrons and ion beams were measured for the first time as were scaling laws for the increase of electron energy and current with input energy. The potential of the plasma focus as an opening switch was then investigated. Measurements of the current and voltage waveforms indicated that the resistance of the pinch was roughly ten times the classical value which was estimated from electron temperature measurements and streak pictures. To increase the efficiency the impaler concept was devised which could have a transfer effi of well over 50% according to the results of a physical model. The frequency of the microwave emission was measured using the delay line technique. The observed frequencies were most consistent with the lower hybrid frequency. GRA

N85-28803# Texas Univ., Austin. Inst. for Fusion Studies.
STABILITY OF HIGH ENERGY PARTICLE PLASMAS TO MHD-LIKE MODES
H. L. Berk and H. V. Wong Jan. 1985 66 p refs
(Contract DE-FG05-80FT-53088)
(DE85-007879; DOE/ET-53088/131; IFSR-131) Avail: NTIS HC A04/MF A01

The stability of symmetric mirror systems, such as tandem mirrors and multiple mirrors (or equivalently bumpy tori of large aspect ratio) is investigated when stabilization is attempted with high energy particles. The analysis is derived from a zero Larmor radius variational form, and the stability criteria for eikonal and long wavelength layer modes are obtained. For eikonal modes it is shown that line-bending can stabilize the low 1-number modes and together with finite Larmor radius effects discussed elsewhere, complete stabilization is possible. For disc-shaped plasma pressure profiles it is shown that currents induced by conducting walls can stabilize l=1 layer mode, while the higher-l layer modes required finite Larmor radius effects for stabilization. For thin ring-like pressure profiles, wall stabilization of the l=1 mode cannot be achieved, although the line bending term reduces the core beta limit and the growth rate of low 1-number layer modes. The coupling of the precessional mode of a plasma ring to the surface Alfven wave in a multiple mirror plasma is also discussed. DOE

N85-28804# Los Alamos Scientific Lab., N. Mex.
FLUID MODELING OF MAGNETIZED PLASMAS
Jeremiah U. Brackbill 1985 16 p refs Presented at the 2nd Intern. School for Space Simulation, Honolulu, Hawaii, 3-16 Feb. 1985
(Contract W-7405-eng-36)
(DE85-007679; LA-UR-85-675; CONF-850266-5) Avail: NTIS HC A02/MF A01

The simplified description given by fluid models of magnetized plasmas makes it possible to simulate large scale problems such as the interaction of the solar wind with the Earth's magnetic field. However, the accurate numerical solution of the fluid equations is made more difficult by the singular nature of the flow when magnetic reconnection occurs. During substorms details of small features of the flow in the magnetotail appear to cause changes in the global solutions. New methods for treating singular problems were developed. Some of these are reviewed, including adaptive meshes and other tricks taken from calculations. Several illustrative problems are described. DOE

N85-28805# Department of Energy, Washington, D. C. Applied Plasma Physics Div.
EXPERIMENTAL PLASMA RESEARCH: PLASMA SUMMARIES
Dec. 1984 127 p refs
(DE85-008116; DOE/ER-0076/2) Avail: NTIS HC A07/MF A01

This is the fifth in a series of Project Summary books going back to 1976. They are issued approximately every two years and provide a short description of each project supported by the

Experimental Plasma Research Branch of the Division of Applied Plasmas Physics in the Office of Fusion Energy. DOE

N85-28806# Oak Ridge National Lab., Tenn.
ACCELERATOR-BASED PLASMA-WALL INTERACTION STUDIES ON THE TEXTOR TOKAMAK
R. A. Zuhr Sep. 1984 20 p refs Presented at 8th Conf. on the Appl. of Accelerators in Res. and Indus., Denton, Tex., 12 Nov. 1984
(Contract DE-AC05-8405-21400)
(DE85-007540; CONF-841117-51) Avail: NTIS HC A02/MF A01

Deposition probes are commonly used to determine plasma edge characteristics in Tokamaks. Such probes are frequently analyzed using accelerator based techniques and can yield information on impurity fluxes, hydrogen fluxes and energies, and surface erosion rates in the plasma edge. Several types of deposition probes were employed to investigate the plasma edge region of the TEXTOR Tokamak in Juelich, FRG. TEXTOR is a moderate size Tokamak (major radius = 1.75 m) that is capable of 2 to 3 s discharges and contains a liner that can be heated to 600(0) C. These capabilities make TEXTOR particularly attractive for the study of plasma wall interactions. Several countries, including the United States, Sweden and the host nation, are carrying on active research programs in the area of plasma edge studied. This research includes measurements of plasma, impurity, and power fluxes at various radii in the scrapeoff layer. The results achieved in characterizing the plasma edge in these recent probe studies on TEXTOR are reviewed. DOE

N85-28807# Los Alamos Scientific Lab., N. Mex.
ANALYSIS OF NONLINEAR PARABOLIC EQUATIONS MODELING PLASMA DIFFUSION ACROSS A MAGNETIC FIELD
J. M. Hyman and P. Rosenau 1984 30 p refs Presented at Am. Math. Soc./SIAM Meeting, Santa Fe, N. Mex., 23 Jul. 1984
(Contract W-7405-eng-36)
(DE85-007683; LA-UR-85-723; CONF-8407103-2) Avail: NTIS HC A03/MF A01

The evolutionary behavior of the solution of a pair of coupled quasilinear parabolic equations modeling the diffusion of heat and mass of a magnetically confined plasma is analyzed. The solution's due to the nonlinear diffusion coefficients, exhibits many new phenomena. In short time, the solution converges into a highly organized symmetric pattern that is almost completely independent of initial data. The asymptotic dynamics then become very simple and take place in a finite demensional space. These conclusions are backed by extensive numerical experimentation. DOE

N85-28808# California Univ., Livermore. Lawrence Livermore Lab.
MULTIPLE TIME-SCALE METHODS IN PARTICLE SIMULATIONS OF PLASMAS
B. I. Cohen 14 Feb. 1985 19 p refs Presented at Orbital Dyn. and Appl. to Accelerators Workshop, Berkeley, Calif., 7 Mar. 1985
(Contract W-7405-eng-48)
(DE85-007519; UCRL-92201; CONF-8503105-1) Avail: NTIS HC A02/MF A01

Advances in the application of multiple time-scale methods to particle simulation of collective phenomena in plasmas are reported. The methods dramatically improve the efficiency of simulating low-frequency kinetic behavior by allowing the use of a large timestep, while retaining accuracy. The numerical schemes provide selective damping of unwanted high-frequency waves and pressure numerical stability in a variety of physics models: electrostatic, magnetoinductive, Darwin and fully electromagnetic. Hybrid simulation models, the implicit moment-equation method, the direct implicit method, orbit averaging, and subcycling are reviewed.DOE

N85-28809# Texas Univ., Austin.
I. F. S. (INSTITUTE FOR FUSION STUDIES) NEWSLETTER, VOLUME 4, NUMBER 1
Paul W. Terry, ed. Jan. 1985 25 p refs
(Contract DE-FG05-80FT-53088)
(DE85-007917; DOE/ET-53088/T1) Avail: NTIS HC A02/MF A01

Summaries of research in the following areas: (1) elimination of stochasticity in vacuum stellarator fields, (2) particle dynamics beyond the quasilinear regime, (3) nonlinear Landau damping of purely perpendicular Bernstein modes, and (4) resistive dynamics of magnetic islands with curvature and pressure. DOE

N85-28810# Argonne National Lab., Ill. Fusion Power Program.
AN IMPURITY CONTROL TEST FACILITY (ICTF) FOR THE STUDY OF FUSION REACTOR/PLASMA EDGE MATERIALS
J. N. Brooks, R. F. Mattas, D. A. Ehst, and N. Hershkowitz (Wisconsin Univ., Madison) Feb. 1985 7 p refs Presented at the 6th Topical Meeting on the Technol. of Fusion Energy, San Francisco, 3 Mar. 1985
(Contract W-31-109-eng-38)
(DE85-007946; CONF-850310-27) Avail: NTIS HC A02/MF A01

A test facility has been designed for investigating many of the impurity control issues associated with fusion reactors. The facility is a steady-state, RF-stabilized mirror with high field and high pumping capability and cells. Analysis indicates that the ICTF should readily produce a plasma with typical parameters of N/sub e/ = 3X10 to the 18th 1/cu.m. T/sub e/ = 50 eV, and T/sub i/ = 100 eV at each end cell. A heat load of approx. 2 MW/sq. m, over areas of approx. 1600 sq. cm could be produced at each end with 800 kW of ICRH power. These conditions would provide a unique capability for examining issues such as erosion/redeposition behavior, properties of redeposited materials, high recycling regimes, plasma edge operating limits for high-Z materials, and particle pumping efficiencies for limiter and divertor designs. DOE

N85-28811# Edgerton, Germeshausen and Grier, Inc., Idaho Falls, Idaho.
RADIATION DAMAGE EXPERIMENTS AND LIFETIME ESTIMATES FOR BERYLLIUM COMPONENTS IN FUSION SYSTEMS
L. G. Miller, J. M. Beeston, and F. J. Fulton (California Univ., Lawrence Livermore National Lab.) 1985 5 p refs Presented at the 6th Topical Meeting on the Technol. of Fusion Energy, San Francisco, 3 Mar. 1985
(Contract DE-AC07-76ID-01570)
(DE85-008038; EGG-M-22784; CONF-850310-28) Avail: NTIS HC A02/MF A01

The critical need for beryllium as a neutron multiplier in fusion blankets provides a driving force to determine beryllium's mechanical performance at high neutron fluences and temperatures. Extrapolation of mechanical performance and lifetimes for beryllium multipliers have been made based on limited high temperature data obtained from EBR-II irradiated beryllium. DOE

N85-28812# Los Alamos Scientific Lab., N. Mex.
TWO-DIMENSIONAL TBR CALCULATIONS FOR CONCEPTUAL COMPACT REVERSED-FIELD PINCH REACTOR BLANKET
J. W. Davidson, M. E. Battat, and D. J. Dudziak 1985 7 p refs Presented at the 6th Topical Meeting on the Technol. of Fusion Energy, San Francisco, 3-7 Mar. 1985
(Contract W-7405-eng-36)
(DE85-007636; LA-UR-85-734; CONF-850310-23) Avail: NTIS HC A02/MF A01

A detailed two-dimensional nucleonic analysis was performed for a conceptual first wall, blanket, and shield design for the Compact Reversed-Field Pinch Reactor. The design includes significant two-dimensional aspects presented by the limiter, vacuum ducts, and coolant manifolds; these aspects seriously degrade the tritium-breeding reaction (TBR) predicted by one-dimensional calculations. A range of design change to increase the TBR were investigated within the two-dimensional analysis. The results of this investigation indicated that an adequate TBR could be achieved with a thinning copper first wall, a (6)Li enrichment near 90%, the proper selection of reflector, and a small addition to the blanket thickness, determined by the one-dimensional analysis. DOE

N85-28813# Edgerton, Germeshausen and Grier, Inc., Idaho Falls, Idaho.
TOKAMAK FUSION CORE EXPERIMENT MAINTENANCE STUDY
Alan M. Snyder and K. D. Watts 1985 5 p refs Presented at the 6th Topical Meeting on the Technol. of Fusion Energy, San Francisco, 3 Mar. 1985
(Contract DE-AC07-76ID-01570)
(DE85-008040; EGG-M-04085; CONF-850310-32) Avail: NTIS HC A02/MF A01

The recently completed Tokamak Fusion Core Experiment (TFCX) design project was carried out to investigate potential next generation Tokamak concepts. An important aspect of this project was the early development and incorporation of remote maintainability throughout the design process. This early coordination and incorporation of maintenance aspects to the design of the device and facilities assures that the machine could ultimately be maintained and repaired in an efficient and cost effective manner. To meet this end, a rigorously formatted engineering trade study was performed to determine the preferred configuration for the TFCX reactor based primarily on maintenance requirements. The study indicated that the preferred design was one with an external vacuum vessel and toroidal field coils that could be removed via a simple radial motion. The trade study is presented and the preferred TFCX configuration is described. DOE

N85-28814# California Univ., Los Angeles. Dept. of Electrical Engineering.
MICROWAVE EXPERIMENTAL STUDIES OF LASER FUSION Final Report, 1 Aug. 1983 - 31 Jul. 1984
N. C. Luhmann, Jr. Feb. 1985 58 p refs
(Contract DE-AS08-83DP-40188)
(DE85-008327; DOE/DP-40188/1) Avail: NTIS HC A04/MF A01

The physics of laser-plasma interactions were modeled via the use of high power (0.1 - 10 MW) microwave (lambda0 = 1 - 10 cm) sources and well-diagnosed low density (n sub e approx. = 10(10)-10(12)cm(-3)) plasma devices. During the past year and a half nonperturbing diagnostic measurements were developed which allow the interaction region to be probed during the microwave pulse without problems with spurious signals such as the sheath resonances associated with conventional Langmuir probe techniques. Particularly successful was the construction and installation of three separate near-millimeter wave collective Thomson scattering system (92, 94 and 185 GHz) which permit the measurement of wave dispersion as well as the absolute level of the associated density fluctuations and their evolution in time. DOE

N85-28815# Oak Ridge National Lab., Tenn. Fusion Engineering Design Center.
IMPURITY CONTROL AND VACUUM PUMPING SYSTEM DESIGN AND ANALYSIS FOR NEXT-GENERATION TOKAMAKS
John R. Haines 1985 14 p refs Presented at the 6th Topical Meeting on the Technol. of Fusion Energy, San Francisco, 3 Mar. 1985
(Contract DE-AC05-84OR-21400)
(DE85-009291; CONF-850310-37) Avail: NTIS HC A02/MF A01

Impurity control system design and performance studies were performed in support of the Tokamak Fusion Core Experiment (TFCX) preconceptual design. Efforts concentrated on the pumped limiter and vacuum pumping system design configuration, thermal/mechanical and erosion lifetime performance of the limiter protective surface, and helium ash removal performance. Analysis results indicate that the limiter/vacuum pumping system design provides marginally adequate helium ash removal. Difficulties in providing adequate helium ash removal for more compact or higher fusion power density devices are addressed. Erosion, primarily by disruption induced vaporization and/or melting, limits the protective surface lifetime to about one calendar year or only about 60 full power hours of operation. In addition to evaluating impurity control system performance for nominal TFCX conditions, these studies attempt to focus on the key plasma physics and engineering design issues that should be addressed in future research and development programs. DOE

N85-28816# Oak Ridge National Lab., Tenn. Fusion Energy Div.
THEORETICAL AND NUMERICAL STUDIES OF MAGNETIC FIELD LINE DISPLACEMENTS IN AN ELMO BUMPY TORUS
D. K. Lee, C. L. Hedrick, and J. D. Callen Feb. 1985 49 p
(Contract DE-AC05-84OR-21400)
(DE85-008757; ORNL/TM-9164) Avail: NTIS HC A03/MF A01

A perturbation procedure is employed to study field line displacements in a magnetic configuration consisting of a dominant (unperturbed) field with closed field lines and a small additional (perturbation) field that causes the perturbed field lines to fail to close on themselves. A differential equation for the deviation of the perturbed field lines from the unperturbed (closed) ones is derived in a first-order perturbation approximation. The total deviation in a circuit, obtained by integrating the equation in the Clebsch representation, is expressed in terms of an action integral representing a longitudinal adiabatic invariant. Numerical results for many related quantities are also presented to verify the obtained analytical results and to compare the first-order approximations with the exact relations. DOE

N85-28817# FOM-Inst. voor Plasmafysica, Rijnhuizen, Jutphaas (Netherlands).
THE TRANSPORT OF NEUTRAL H, D, T AND He AND O IN THE BOUNDARY LAYERS OF A TOKAMAK PLASMA
W. J. Goedheer Dec. 1984 48 p refs Sponsored by Euratom and Nederlandse Organisatie voor Zuiver-Wetenschappelijk Onderzoek
(Rept-84-153) Avail: NTIS HC A03/MF A01

The density profiles of neutral H, D, T, He and O in the boundary layers of a Tokamak plasma were obtained from the solution of the Boltzmann equation for the velocity distribution function. Besides the neutral components of the main plasma, H, D, and T, helium and oxygen are treated as impurities; helium, because it has a relatively large mean free path, and oxygen, because it has an accidentally resonant cross section for charge exchange with protons, deuterons and tritons. The results are compared with analytical results for simplified cases. Author (ESA)

N85-28145# Joint Publications Research Service, Arlington, Va.
FLAT MAGNETOHYDRODYNAMIC INDUCTION PUMP Abstract Only
Ya. Ya. Valdmanis, R. R. Krishberg, and A. Ya. Shishko *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-85-004) 15 May 1985 p 12-13 Transl. into ENGLISH from Magnitn. Girodinam. (USSR), no. 4, Oct. - Dec. 1984 p 101-104 (For primary document see N85-28142 17-31)
Avail: NTIS HC A06/MF A01

N85-28146# Joint Publications Research Service, Arlington, Va.
DEPENDENCE OF CHARACTERISTICS OF CENTRIFUGAL MAGNETOHYDRODYNAMIC CONDUCTION PUMP ON ELECTRICAL CONDUCTANCE OF END WALLS. PART 1: EXPERIMENT Abstract Only
V. A. Gorbunov, A. A. Klyukin, Yu. B. Kolesnikov, and V. Ye. Kolokolov *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-85-004) 15 May 1985 p 13 Transl. into ENGLISH from Magnitn. Girodinam. (USSR), no. 4, Oct. - Dec. 1984 p 105-108 (For primary document see N85-28142 17-31)
Avail: NTIS HC A06/MF A01

N85-28160# Joint Publications Research Service, Arlington, Va.
STEFAN-MAXWELL RELATIONS FOR PLASMA DIFFUSION CURRENTS IN MAGNETIC FIELD Abstract Only
A. F. Kolesnikov and G. A. Tirskiy *In its* USSR Rept.: Eng. and Equipment (JPRS-UEQ-85-004) 15 May 1985 p 83-84 Transl. into ENGLISH from Izv. Akad. Nauk SSSR: Mekhan. Zhidkosti i Gaza (Moscow), no. 4, Jul. - Aug. 1984 p 148-154 (For primary document see N85-28142 17-31)
Avail: NTIS HC A06/MF A01

76 SOLID-STATE PHYSICS

Includes superconductivity.

For related information, see also *33 Electronics and Electrical Engineering* and *36 Lasers and Masers.*

N85-28818*# Virginia State Univ., Petersburg. Solid State Physics Research Inst.
[ACTIVITIES OF THE SOLID STATE PHYSICS RESEARCH INSTITUTE] Annual Report, 1 Jan. - 31 Dec. 1984
31 Dec. 1984 95 p refs
(Grant NAG1-416)
(NASA-CR-175899; NAS 1.26:175899) Avail: NTIS HC A05/MF A01 CSCL 20L

Three research programs are reviewed. These programs are muon spin rotation, studies of annealing in gallium arsenide and Hall effect studies in semiconductors. The muon spin rotation work centers around the development of a facility at the Alternating Gradient Synchrotron of BNL. Studies of annealing in GaAs concerns itself with the measurement of depolarization in GaAs. The Hall effect studies of proton damaged semiconductors provide new information on the nature of defects and dislocations in GaAs. For individual titles, see N85-28819 through N85-28821.

N85-28819*# Virginia State Univ., Petersburg.
MUON SPIN ROTATION STUDIES
In its Activities of the Solid State Physics Research Inst. 31 Dec. 1984 22 p (For primary document see N85-28818 17-76)
Avail: NTIS HC A05/MF A01 CSCL 20L

The bulk of the muon spin rotation research work centered around the development of the muon spin rotation facility at the Alternating Gradient Synchrotron (AGS) of Brookhaven National Laboratory (BNL). The collimation system was both designed and fabricated at Virginia State University. This improved collimation system, plus improvements in detectors and electronics enabled the acquisition of spectra free of background out to 15 microseconds. There were two runs at Brookhaven in 1984, one run was devoted primarily to beam development and the other run allowed several successful experiments to be performed. The effect of uniaxial strain on an Fe(Si) crystal at elevated temperature (360K) was measured and the results are incorporated herein. A complete analysis of Fe pulling data taken earlier is included. E.R.

N85-28820*# College of William and Mary, Williamsburg, Va. Dept. of Physics.
UNIAXIAL STRESS INDUCED SYMMETRY BREAKING FOR MUON SITES IN Fe
W. J. Kossler, M. Namkung, B. Hitti, Y. Li, J. Kempton, C. E. Stronach (Virginia State Univ.), L. R. Goode, Jr. (Virginia State Univ.), W. F. Lankford (George Mason Univ.), B. D. Patterson (Zurich Univ.), W. Kuendig (Zurich Univ.) et al *In* Virginia State Univ. [Activities of the Solid State Physics Research Inst. 31 Dec. 1984 33 p refs (For primary document see N85-28818 17-76)
Avail: NTIS HC A05/MF A01 CSCL 20L

Uniaxial stress was used on Fe single crystals to induce muon precession frequency shifts. The frequency shift for a nominally pure Fe sample at 302K was -0.34 + or - .023 MHz per 100 microstrain along the <100> magnetization axis. This corresponds to a change of magnetic field at the muon of 25.1 + to 1.6G/100 magnetic moment. For an Fe (3wt%Si) single crystal the shifts were -0.348 + or - .008 MHz/100 magnetic moment. The agreement between the shifts for Fe and Fe(3wt%Si) shows the effect to be intrinsic to iron and not strongly impurity sensitive. These shifts and their temperature dependence (1/T) are dominated by the effect of strain inducted population shifts between crystallographically equivalent, but mgnetically inequivalent sites. Their magnitudes are in good agreement ith previous theoretical predictions and by previous extrapolation from calculations on Nb and V especially if both 4T(0) and 1T sites contribute comparably. Author

N85-28821*# College of William and Mary, Williamsburg, Va.
A 200-MeV PI(+) INDUCED NUCLEON REMOVAL FROM 24Mg
Donald Joyce, Herbert O. Funsten, B. Joseph Lieb (George Mason Univ.), Hans S. Plendl (Florida State Univ., Tallahassee), Joseph Norton (Florida State Univ., Tallahassee), Carey E. Stronach (Virginia State Univ.), V. Gordon Lind (Utah State Univ., Logan), Robert E. McAdams (Utah State Univ., Logan), O. Harry Otteson (Utah State Univ., Logan), and L. Wayne Swenson (LASL) *In* Virginia State Univ. [Atlvities of the Solid State Physics Research Inst. 31 Dec. 1984 38 p refs (For primary document see N85-28818 17-76)
Avail: NTIS HC A05/MF A01 CSCL 20L

Nuclear gamma rays in coincidence with outgoing pions and/or protons following single nucleon removal from Mg24 by 200 MeV pi(+) were detected with Ge(Li) detectors. Differential cross sections are reported for gamma rays from the first excited mirror states of Na23 to Mg23 in coincidence with positive pions and/or protons detected in particle telescopes at 30, 60, 90, 120 and 150 deg; angle integrated absolute cross sections and cross section ratios sigma (Mg23/sigma (Na23) are calculated. These results are compared with the predictions of the one step quasifree (OSQF), the intranuclear cascade (INC), and the nucleon charge exchange (NCX) reaction models. The OSQF and the INC calculations generally agree with the experimental results, while the NCX calculations are in disagreement. Author

N85-28822*# Utah Univ., Salt Lake City. Dept. of Physics.
MORPHOLOGICAL STABILITY AND FLUID DYNAMICS OF VAPOR CRYSTAL GROWTH Semiannual Progress Report, 1 Dec. 1984 - 31 May 1985
Franz E. Rosenberger 31 May 1985 5 p
(Grant NsG-1534)
(NASA-CR-175879; NAS 1.26:175879) Avail: NTIS HC A02/MF A01 CSCL 20B

Progress is reported in establishing the capabilities of thermal deflection spectroscopy for measurements of the concentration field around a growing crystal. Work was completed on the inclusion of the next nearest neighbor interaction into a surface roughness model and the resulting formalism was applied to copper, zinc, and lead. Other work in mass spectroscopy and vapor transport is discussed. R.J.F.

N85-28823*# Utah Univ., Salt Lake City. Dept. of Physics.
MORPHOLOGICAL STABILITY AND FLUID DYNAMICS OF VAPOR CRYSTAL GROWTH Semiannual Progress Report, 1 Jun. - 30 Nov. 1984
Franz E. Rosenberger 30 Nov. 1984 5 p
(Grant NsG-1534)
(NASA-CR-175880; NAS 1.26:175880) Avail: NTIS HC A02/MF A01 CSCL 20B

Research on morphological stability and fluid dynamics of crystal growth is discussed. Interfacial heat and mass transfer research is discussed. The finding of surface roughening is a precursor to a solid-solid phase transition was further quantified. Progress was obtained with the mass spectroscopic characterization of GeSe-Ge I sub 4. R.J.F.

N85-28824*# Howard Univ., Washington, D. C. Solid-State Electronics Group.
COMMUNICATIONS AND LOGIC SYSTEMS AT MILLIMETER WAVE FREQUENCIES Final Report
Sep. 1983 104 p refs
(Grant NAG5-248)
(NASA-CR-175859; NAS 1.26:175859) Avail: NTIS HC A06/MF A01 CSCL 20L

Activities in materials development, lithography, FET experiments, and mixer diode fabrication are reported. In addition, articles are presented which address leakage effects in n-GaAs MESFET's and lateral nonuniform doping in GaAs MESFET's. For individual titles, see N85-28825 through N85-28827.

N85-28825*# Howard Univ., Washington, D. C.
COMMUNICATIONS AND LOGIC SYSTEMS AT MILLIMETER WAVE FREQUENCIES, SUMMARY Final Report
In its Commun. and Logic Systems at Millimeter Wave Freq. Sep.

1983 47 p refs (For primary document see N85-28824 17-76)
Avail: NTIS HC A06/MF A01 CSCL 20L

During the contract period an AsCl3 epitaxial system used to provide buffer layers for FET structures was constructed. A submicron lithographic processes using deep U.V. techniques was developed and, employing these techniques, a working .5 micron gate device was produced. In addition, the development of submicron mixer diodes continued. The gettering of substrates of a technique to improve the mobility of ionimplantated layers was investigated. The result of this experiment showed a correlation between improved hall mobilities and gettered substrates. Finally, several theoretical studies are reported. Author

N85-28826*# Howard Univ., Washington, D. C. Dept. of Electrical Engineering.
LEAKAGE EFFECTS IN n-GaAs MESFET WITH n-GaAs BUFFER LAYER
Yen-Chu Wang and Mahmoud Bahrami *In its* Commun. and Logic Systems at Millimeter Wave Freq. Sep. 1983 32 p refs Submitted for publication (For primary document see N85-28824 17-76)
Avail: NTIS HC A06/MF A01 CSCL 20L

Whereas improvement of the interface between the active layer and the buffer layer has been demonstrated, the leakage effects can be important if the buffer layer resistivity is not sufficiently high and/or the buffer layer thickness is not sufficiently small. It was found that two buffer leakage currents exist from the channel under the gate to the source and from drain to the channel in addition to the buffer leakage resistance between drain and source. It is shown that for a 1 micron gate-length n-GaAs MESFET, if the buffer layer resistivity is 12 OHM-CM and the buffer layer thickness h is 2 microns, the performance of the device degrades drastically. It is suggested that h should be below 2 microns.
Author

N85-28827*# Howard Univ., Washington, D. C. Dept. of Electrical Engineering.
GaAs MESFET WITH LATERAL NON-UNIFORM DOPING
Yen-Chu Wang and Mahmoud Bahrami *In its* Commun. and Logic Systems at Millimeter Wave Freq. Sep. 1983 24 p refs Submitted for publication (For primary document see N85-28824 17-76)
Avail: NTIS HC A06/MF A01 CSCL 20L

An analytical model of the GaAs MESFET with arbitrary non-uniform doping is presented. Numerical results for linear lateral doping profile are given as a special case. Theoretical considerations predict that better device linearity and improved F(T) can be obtained by using linear lateral doping when doping density increases from source to drain. Author

N85-28828# Lincoln Lab., Mass. Inst. of Tech., Lexington.
InP MATERIALS Annual Technical Summary Report, 1 Oct. 1983 - 30 Sep. 1984
G. W. Iseler 30 Sep. 1984 33 p
(Contract F19628-85-C-0002)
(AD-A152341; ESD-TR-84-287) Avail: NTIS HC A03/MF A01 CSCL 20/12

The goals of the InP materials program T Lincoln Lab are the development of reliable techniques for preparing high-quality InP (Indium Phosphide) crystals with controlled electrical properties and the utilization of these techniques to produce crystals needed for research on optoelectronic devices such as InP photoconductive switches and GaInAsP/InP diode lasers and detectors and on electronic devices such as JFETs. The program consists of two parts: synthesis of InP from the elements, and crystal growth by the liquid-encapsulated Czochralski (LEC) method. Synthesis is carried out in order to assure an adequate supply of charge material with the purity desired for LEC growth, since such material is not consistently available from commercial sources. The principal donor in less pure polycrystalline ingots was identified as Si, which probably originated in the as-received P. Initial experiments have been performed on in situ synthesis of InP in the LEC puller, measurement of the microscopic growth rate of LEC crystals, and the use of a two-piece susceptor to reduce the dislocation density in these crystals. GRA

N85-28829# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
SPEED-UP TECHNIQUES FOR COMPLEMENTARY METAL OXIDE SEMICONDUCTOR VERY LARGE SCALE INTEGRATION M.S. Thesis
B. T. Kelley 14 Dec. 1984 387 p
(AD-A152466; AD-E440273; AFIT/GE/ENG/84D-41) Avail: NTIS HC A17/MF A01 CSCL 20/12

Methods of increasing the operating speed of integrated circuits were investigated and a reference to speed-up techniques was generated. Precharging, a specific method, was applied to existing and newly designed CMOS/SOS circuit elements and evaluated. The SPICE computer program was used for transient signal timing analysis. Precharging was applied to a test circuit, the first bitslice of a previously designed ALU circuit and three newly designed chip circuit elements, to determine its effect on the operating speed of each circuit. Precharge configurations of each circuit were then simulated with SPICE. The results of this thesis research indicate that precharging can be applied to both existing and newly designed circuits, that it significantly reduces low-to-high signal transition delays, if applied correctly, and, in general, it has a detremental effect on high-to-low signal transitions, and increases the associated delays. In addition, the effectiveness of precharging is dependent on the amount of current applied to the precharged nodes. GRA

N85-28830# California Univ., Santa Barbara. Dept. of Chemistry.
THE MEAN TRAJECTORY APPROXIMATION FOR CHARGE AND ENERGY TRANSFER PROCESSES AT SURFACES Annual Technical Report
S. I. Sawada, A. Nitzan, and H. Metiu Mar. 1985 74 p
(Contract N00014-81-K-0598)
(AD-A152708; TR-13) Avail: NTIS HC A04/MF A01 CSCL 20/8

We discuss electronic energy and charge transfer processes at surfaces in terms of curve crossing models. We suggest that at low kinetic energies the trajectory approximation should be replaced by a mean trajectory approximation (MTA), in which the nuclear motion gets feedback from and adjusts to the curve crossing dynamics. We discuss two derivations of MTA by using an eikonal approximation and a path integral method. The effects of phonon or electron-hole pair excitations on the charge transfer process are also incorporated. GRA

N85-28831# Florida State Univ., Tallahassee. Dept. of Statistics.
CENTRAL LIMIT THEOREMS IN THE AREA OF LARGE DEVIATIONS FOR SOME DEPENDENT RANDOM VARIABLES
N. R. Chaganty and J. Sethuraman Jan. 1985 32 p Prepared in cooperation with Old Dominion Univ., Norfolk, VA
(Contract DAAG29-82-K-0168)
(AD-A153125; FSU-STATISTICS-M692; TR-D-75-ARO; ARO-19367.24-MA) Avail: NTIS HC A03/MF A01 CSCL 20/2

In this article we obtain central limit theorems for some dependent random variables which are used to describe the distribution of magnetic spins present in a ferromagnet crystal. A ferromagnet crystal consists of a large number of sites. At site 1 there is some amount of magnetic spins present. The magnetic spin present at any site interacts with the magnetic spins at its neighboring sites and hence gives rise to some dependency among the magnetic spin present. GRA

N85-28832# Hughes Research Labs., Malibu, Calif.
MATERIALS-PROCESS INTERACTIONS IN TERNARY ALLOY SEMICONDUCTORS Final Report, 1 May 1982 - 31 Oct. 1983
K. V. Vaidyanathan, H. L. Dunlap, G. S. Kamath, and J. F. Wager, III Aug. 1984 42 p
(Contract N00019-82-C-0066)
(AD-A153133) Avail: NTIS HC A03/MF A01 CSCL 07/2

Properties of InGaAs implantation doping of InGaAs, photoluminescence properties of InGaAs, surface studies on InGaAs, X-ray photoelectron spectroscopy and electron energy loss

spectroscopy studies in InGaAs. The report describes the electrical and optical properties of In(0.53)Ga(0.47)As layers grown by liquid phase epitaxy on InP substrates. The report also describes on implantation doping experiments to form nand p-type layers in In(0.53)Ga(0.47)As. High degree of n-type electrical activation can be achieved in Si-implanted samples. Formation of p-type layers by Be- or Mg-ion implantation is much more difficult. X-ray photoemission (ELS) studies show that the native oxides present on chemically etched In(0.53)Ga(0.47)As consist predominantly of As2O3 and oxides of In. Plasma enhanced deposition of SiO2 at 300 deg C does not significantly change the thickness of the native oxide. Although capacitance-voltage measurements on the MIS capacitors on In(0.53)Ga(0.47)As exhibit high, the surface potential can be modulated, PECVD SiO2 appears to be a viable candidate as a gate dielectric for In(0.53)Ga(0.47)As MISFETs. GRA

N85-28833# Johns Hopkins Univ., Baltimore, Md.
ELECTRONICALLY EXCITED ALKALINE EARTH OXIDES: CHEMICAL PRODUCTION AND COLLISIONAL ENERGY TRANSFER PROCESSES Final Report, 15 May 1978 - 18 Dec. 1984
P. J. Dagdigian and M. H. Alexander 22 Feb. 1985 15 p
(Contract DAAG29-81-K-0102; Grant DAAG29-78-G-0110)
(AD-A153172; ARO-15557.10-CH; ARO-18271.29-CH) Avail: NTIS HC A02/MF A01 CSCL 07/2

A collaborative experimental and theoretical study both of the reactions of electronically excited alkaline earth atoms with molecular oxidants and of inelastic and reactive processes involving open-shell atoms and molecules has been carried out. The branching ratios for formation of ground and excited state products from the reactions of both ground state (1S) and metastable electronically excited (3Po, 1D, or 3D) Mg, Ca, Sr, and Ba were determined by chemiluminescence and laser fluorescence measurements. These results were compared wtih adiabatic correlation predictions. It was also possible to set bounds on the CaO and MgO dissociation energies. A semi-empirical representation was developed for the description of the ion-pair (M(+)O2(-)) potential energy surfaces for both alkali and alkaline earth atoms. A semi classical dipolar model was developed for the calculation of collisional interelectronic energy transfer rates between the low-lying X1sigma(+), a 3Pi, and A 1Pi states of CaO and used to interpret the observed pressure dependence of the Ca (3Po) + N2O chemiluminescence spectrum. This model was also extended to energy transfer in MgO. GRA

N85-28834# Arizona State Univ., Tempe.
THE EFFECT OF ION-BOMBARDMENT-INDUCED ATOMIC MIXING ON DEPTH-PROFILING OF INTERFACES Final Report, 1 Sep. 1981 - 31 Dec. 1984
I. S. T. Tsong 11 Mar. 1985 8 p
(Contract DAAG29-81-K-0162)
(AD-A153199; ARO-18762.7-MS) Avail: NTIS HC A02/MF A01 CSCL 20/8

When a solid is subjected to energetic ion bombardment, relocation of atoms within the solid takes place due to collisional effects between the incoming ion and the target atoms and also due to creation of point defects. Such a process is known as atomic-mixing which clearly manifests itself in the degradation of the depth-profiles of interfaces obtained by sputter-sectioning in conjunction with a surface analytical technique such as secondary ion mass spectrometry (SIMS), Auger electron spectrometry and X-ray photoemission spectrometry. By conducting SIMS depth-profiling of various silicon/metal multilayer structures in the temperature range 78K to 800K, the two contributions to atomic mixing were studied in detail. We found that ballistic mixing contribution at low temperatures can be adequately described by a diffusion model which leads to a deconvolution procedure to improve the depth resolution of SIMS depth-profiles. GRA

N85-28835# Rockwell International Science Center, Thousand Oaks, Calif.
PROPERTIES OF DEFECTS IN Hg(1-X)Cd(X)Te Final Technical Report, 1 Jul. 1981 - 30 Sep. 1984
S. H. Shin and J. Bajaj Nov. 1984 91 p
(Contract DAAG29-81-C-0012; DA Proj. 1L1-61102-BH-57)
(AD-A153243; SC5305.6FR; ARO-17721.7EL) Avail: NTIS HC A05/MF A01 CSCL 20/2

This final report covers the progress made over the July 1, 1981 through September 30, 1984 period. The majority of the contract effort was focused in this period on systematic investigations of the basic physics of defects in HgCdTe. Detailed electrical characterization of LPE HgCdTe has been carried out. The normal range of values in carrier concentrations, mobilities and minority carrier lifetimes was established by Hall effect and photoconductive decay lifetime measurements. The total equilibrium concentration of cation vacancies was studied qualitatively and compared with model calculations. The results show that the doubly ionized vacancy state is dominant and the cation vacancy formation energy (Ef) is found to be 0.9 + or - 0.1 eV for Hg1-xCdxTe and nearly independent of the Cd composition x. Te precipitates in CdTe have been characterized by Auger spectroscopy, X-ray diffraction and Raman spectroscopy. The X-ray results show that precipitated Te in Bridgman-grown CdTe crystals has the same structural phase as observed in elemental Te under high pressure. Auger and Raman microprobe spectroscopy were carried out to confirm Te precipitates in CdTe and identify the symmetry of the Te precipitates. Acceptor ionization energies (EA) in Hg1-xCdxTe material were also investigated as a function of annealing temperature. These EA values, as observed from Hall measurements, decrease from 20 to 10 meV as anneal temperature decreases from 488 to 347 C. GRA

N85-28836# Department of the Air Force, Washington, D.C.
TELESCOPING LOW VIBRATION PULLING MECHANISM FOR CZOCHRALSKI CRYSTAL GROWTH Patent Application
G. W. Iseler, inventor (to Air Force) Filed 26 Feb. 1985 12 p
(AD-D011655; US-Patent-Appl-SN-705816) Avail: NTIS HC A02/MF A01 CSCL 17/8

A telescoping low vibration pulling mechanism is described for use in Czochralski crystal growth apparatus, comprising a broached brushing which defines an internal circumference of teeth on the circumference of a splined shaft. The brushing is coupled to the means for rotation via a hollow tube and the splined shaft, couplable to a seed shaft, and an elevation means telescopes through said brushing within said hollow tube. Author (GRA)

N85-28837# Iowa State Univ. of Science and Technology, Ames.
NEW EXAMPLES OF CLUSTERS, EXTENDED METAL-METAL BONDING AND INTERSTITIAL DERIVATIVES
J. D. Corbett 1984 4 p refs Presented at 8th Intern. Conf. on Solid Compounds of the Transition Elements, Vienna, 9 Apr. 1984
(Contract W-7405-eng-82)
(DE85-005926; IS-M-536; CONF-8404234-1) Avail: NTIS HC A02/MF A01

Synthesis of many new compounds with unusual stoichiometries and with structures that exhibit strong metal-metal bonding has been achieved in the last 10 to 12 years in binary halides of the early transition metals. Such characteristics had previously been limited to metal octahedra in the well-known (Nb,Ta)6X12/sup n+/ and (Mo,W)6X8/sup m+/ halide clusters (6 to 12 and 6 to 8 types, respectively; X = Cl, Br, I). This new chemistry is found for highly reduced binary halides of the metals Sc, Y, La, Zr, Hf and some lanthanides. The metal-metal arrays in these may be classified as conventional 6 to 12 or 6 to 8 type clusters that have, in response to reduced X:M ratios, condensed by sharing metal-metal edges to form infinite chains or sheets of lusters. The structures and properties thus lie along the interface between metals and normal salts (1,2,3). The use of welded niobium or tantalum containers has been vital to these discoveries, most of the product being achieved in relatively long-term reactions at 600 to 1000 C. Some of the compounds have been found to bind a variety of small nonmetals within the metal interstices while others are uniquely stabilized by such interstitial atoms. DOE

N85-28838# Oak Ridge National Lab., Tenn.
HANDBOOK ON SUPERCONDUCTIVITY: THE LARGE-SCALE

APPLICATIONS. CHAPTER 4
L. Dresner 1984 138 p refs
(Contract DE-AC05-84OR-21400)
(DE85-008170; DOE/OR-21400/T97-Ch-4) Avail: NTIS HC A07/MF A01

One way to cool a magnet is to immerse it in a bath of liquid helium. Boiling helium is a favorite because of helium's large latent heat of vaporization, but as in all boiling heat transfer, blanketing of the surface by vapor (film boiling) limits the attainable heat transfer. A second way to cool is with single phase supercritical helium. To make the heat transfer high, helium in turbulent flow is forced through hollow conductors. A third way to cool is with He 2 at atmospheric pressure. The He 2 phase of helium, which remains liquid right down to absolute zero, has some remarkable properties that distinguish it from all other liquids, including the normal liquid phase of helium, He-I. These properties have excited great interest in He-2 as a coolant for superconducting magnets. Each of these ways of cooling leads to a class of specialized problems that are discussed in detail. A somewhat different way to forestall quenches is to put the conductor in a material that tightly confines it and to cool it indirectly by conduction to helium not directly in contact with it. The special problems of this approach are discussed as well. DOE

N85-28839# California Univ., Livermore. Lawrence Livermore Lab.
RAPID GROWTH OF POTASSIUM DIHYDROGEN PHOSPHATE CRYSTALS
J. F. Cooper and M. F. Singleton 24 Jan. 1985 22 p refs Presented at Intern. Conf. on Lasers, 1984, San Francisco, 26 Nov. 1984
(Contract W-7405-eng-48)
(DE85-007261; UCRL-91795; CONF-8411153-2) Avail: NTIS HC A02/MF A01

A process for high rate (15 mm/d) growth of potassium dihydrogen phosphate single crystals was developed. Correlations for mass transport by convective diffusion (to cones or disks under axially-impinging flow) are applied to published rate data on 3-mm KDP crystals to derive a semi-empirical kinetic equation for (101) growth rate measured in the z direction: g/sub z/ = k/sub g/ exp(-H/sub g//RT)(c/sub s/-c/sub sat/)/sup n/, where the coefficients found by linear regression are k/sub g/ = 3492 m/s, H/sub g/ = 41,399 J/mcl and n = 2.277; and c/sub s/ and c/sub sat/ are, respectively, the surface- and saturation concentrations (kg-KDP/kg-water). Material properties, transport, and kinetic equations are then solved numerically to predict the dependence of growth rate on temperature, supersaturation, and the ratio of flow rate to a crystal dimension. The model is experimentally verified for 20 to 25 mm crystals grown at rates of 5 to 25 mm/d using a turbine to enhance solute flux to the pyramidal faces. High growth rate of large crystals is possible and scales according to the ratio of characteristic velocity to crystal dimension. DOE

N85-28840# Purdue Univ., Lafayette, Ind.
HALL MOBILITY IN FLUID ARGON Progress Report, 1 Dec. 1983 - 1 Jan. 1985
G. Ascarelli Feb. 1985 16 p refs
(Contract DE-FG02-84ER-13212)
(DE85-007288; DOE/ER-13212/1) Avail: NTIS HC A02/MF A01

Initial measurements, carried out on a 9-inch Varian magnet, gave a mobility of 1600 cm(2)/Vs. The hall signal, however, was not as great as expected, and an excessive stray magnetic field was found. The system, hence, was rebuilt. The theory of mobility of electrons in liquefied rare gases is discussed, including scattering by density fluctuations and phonon scattering. DOE

N85-28841# Rochester Univ., N. Y. Dept. of Physics and Astronomy.
LATTICE ACTIONS IMPROVED BY BLOCK-SPIN RENORMALISATION GROUP AND MAXIMALLY SYMMETRIC LATTICES
A. Guha 1984 19 p refs Presented at the Silver Jubilee Workshop on Recent Advan. in Theoretical Phys., Kanpur, India, 5 Dec. 1984
(Contract DE-AC02-76ER-13065)
(DE85-007416; DOE/ER-13065/408; CONF-841262-1) Avail: NTIS HC A02/MF A01

Two different schemes of improving lattice actions based on Block-Spin renormalization group (BSRG) and maximally symmetric lattices are discussed. In the first scheme, the BSRG technique was applied to find the renormalized trajectory explicity for 0(infinity) Heisenberg spin model in two dimensions. For 0(3) and 0(4) models a four parameter action near the large N renormalized trajectory was chosen and a remarkable improvement in the approach to continuum limit by performing Monte Carlo simulations was demonstrated. In the second scheme, a possible improvement of scaling the Lorentz invariance based on the simple idea of maximally symmetric lattices is shown. Numerical evidence for improvement in two-dimensional SU(3) chiral model and 0(3) nonlinear sigma model is presented. DOE

N85-28842# Midwest Research Inst., Golden, Colo. Solar Energy Research Inst.
MORPHOLOGY OF GaAs/SUB 1-x/P/SUB x/ SUPERLATTICES GROWN BY MOCVD AND CHLORIDE VPE
A. E. Blakeslee, A. Kibbler, and M. W. Wanless Mar. 1985 20 p refs Presented at the Intern. Conf. on Superlattices, Microstruct. and Microdevices, Champaign-Urbana, Ill., 13 Aug. 1984
(Contract DE-AC02-83CH-10093)
(DE85-002944; SERI/TP-212-2576; CONF-840877-5) Avail: NTIS HC A02/MF A01

Distorted layer growth manifested by nonuniform etching may occur in GaAs/sub 1-x/P/sub x/ superlattices grown by MOCVD and VPE. The distortion was found to be more severe for MOCVD growth than for VPE. The distortion is decreased by decreasing the magnitude of the interlayer strain in the superlattice but does not depend upon the layer thickness. The rate of crystal growth, the temperature of growth and the strain rate in the layer supporting the superlattice also influence the distortion. Several possible causes of the effect are discussed, including nonuniform elastic stress and/or compositional nonuniformity. DOE

N85-28843# Siemens A.G., Munich (West Germany). Unternehmensbereich Bauelemente.
FURTHER DEVELOPMENT OF HIGH VOLTAGE SIPMOS FET's TO FULFILL MARKET NEEDS Final Report, Sep. 1983
Jenoe Tihanyi Bonn Bundesministerium fuer Forschung und Technologie Dec. 1984 46 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-84-255; ISSN-0340-7608) Avail: NTIS HC A03/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 10

High voltage SIPMOS FET's with improved stability and fast recovery reverse diodes were developed. Investigations to reduce the input capacitance of MOS switches were carried out to design devices which are better adapted to integrated circuits. The results of investigations to reduce the switching resistance of high voltage MOSFET's are not directly applicable. Author (ESA)

77 THERMODYNAMICS AND STATISTICAL PHYSICS

Includes quantum mechanics; and Bose and Fermi statistics.

For related information see also *25 Inorganic and Physical Chemistry* and *34 Fluid Mechanics and Heat Transfer.*

N85-28844 Metals Society, London (England).
THERMODYNAMIC CALCULATIONS OF EQUILIBRIUM STATES IN METAL-CARBON-HYDROGEN-OXYGEN SYSTEM
D. Lambiev and P. Kamenov 3 Jan. 1984 11 p refs Transl. into ENGLISH from Met. (Sofia), no. 12, 1982 p 16-19
(BLL-BISI-Trans-22092-(9022.06)) Avail: British Library Lending Div., Boston Spa, Engl.

Thermodynamic calculations of equilibrium states in the metal-carbon-hydrogen-oxygen system are presented. Equations, tables and curves of the relevant paramters are given. B.W.

N85-28845# California Univ., Santa Barbara. Dept. of Chemistry.
THE STRATEGY FOR TIME DEPENDENT QUANTUM MECHANICAL CALCULATIONS USING A GAUSSIAN WAVE PACKET REPRESENTATION OF THE WAVE FUNCTION Annual Technical Report
S. I. Sawada, R. Heather, B. Jackson, and H. Metiu 1985 73 p
(Contract N00014-81-K-0598)
(AD-A152709; TR-17) Avail: NTIS HC A04/MF A01 CSCL 20/10

We develop methodology for performing time dependent quantum mechanical calculations by representing the wave function as a sum of Gaussian wave packets (GWP), each characterized by a set of parameters such as width, position, momentum and phase. The problem of computing the time evolution of the wave function is thus reduced to that of finding the time evolution of the parameters in the Gaussians. This parameter motion is determined by minimizing the error made by replacing the exact wave function in the time dependent Schroedinger equation with its Gaussian representation approximant. This leads to first order differential equations for the time dependence of the parameters, and those describing the packet position and the momentum of each packet have some resemblance with the classical equations of motion. The paper studies numerically the strategy needed to achieve the best GWP representation of time dependent processes. GRA

N85-28846# California Inst. of Tech., Pasadena.
NONLINEAR PROBLEMS IN CONTINUUM MECHANICS Final Report, 1 Aug. 1981 - 31 Jul. 1984
H. B. Keller and D. S. Cohen Oct. 1984 14 p
(Contract DAAG29-81-K-0107)
(AD-A153387; ARO-18210.7-MA) Avail: NTIS HC A02/MF A01 CSCL 20/11

The theory and application of bifurcation has been advanced in a wide array of problems in fluid dynamics and in reaction-diffusion systems. New models for diffusion in glassy polymers have been proposed and analyzed. New methods, both numerical and analytical, have been developed and applied to solving and analyzing bifurcation and other nonlinear problems. GRA

N85-28847# Washington Univ., Seattle. Dept. of Physics.
SPECIAL RELATIVITY OF KALUZA-KLEIN
M. D. Maia (Brasilia Univ.) 1984 7 p refs
(Contract DE-AC06-81ER-40048)
(DE85-007838; DOE/ER-40048/26-P4) Avail: NTIS HC A02/MF A01

Kaluza-Klein theory is formulated from the point of view of the Gauss geometry of embedded manifolds. According to this view, space-time is regarded as locally and isometrically embedded in the high dimensional space predicted by that theory. The high dimensional Minkowski space is considered as a particular solution of the high dimensional vacuum Einstein's equations and it is assumed to represent the ground state of the theory. In this particular case it is shown that the compactification of the space of internal variables follows from the second quadratic forms of the Gaussian geometry of space-time. The Gauss-Codazzi-Ricci integrability conditions are interpreted as the field equations for a low energy observer. The space-time reduced Einstein-Hilbert action is interpreted as an integral equation on the size of the internal space. DOE

N85-28848# Center for Mathematics and Computer Science, Amsterdam (Netherlands). Dept. of Applied Mathematics.
ON THE PROPAGATION SPEED IN RELATIVISTIC QUANTUM MECHANICS
B. Dijkhuis Sep. 1984 9 p refs Submitted for publication
(CWI-AM-R8410; B8478812) Avail: NTIS HC A02/MF A01

A definition of propagation speed is proposed. Assuming that there is a maximal speed, an operator condition that resembles the condition of local commutativity in quantum field theory is derived. The relativistic energy-momentun realtion implies that the maximal speed is not smaller that the speed of light. An example that shows a superluminal propagation speed is discussed. Author (ESA)

80 SOCIAL SCIENCES (GENERAL)

Includes educational matters.

N85-28849*# Ferguson Bryan, Washington, D.C.
SUMMER HIGH SCHOOL APPRENTICESHIP RESEARCH PROGRAM (SHARP) OF THE NATIONAL AERONAUTICS AND SPACE ADMINISTRATION Final Report
28 Sep. 1984 46 p
(Contract NASw-3838)
(NASA-CR-175791; NAS 1.26:175791) Avail: NTIS HC A03/MF A01 CSCL 05I

A total of 125 talented high school students had the opportunity to gain first hand experience about science and engineering careers by working directly with a NASA scientist or engineer during the summer. This marked the fifth year of operation for NASA's Summer High School Apprenticehsip Research Program (SHARP). Ferguson Bryan served as the SHARP contractor and worked closely with NASA staff at Headquarters and the eight participating sites to plan, implement, and evaluate the Program. The main objectives were to strengthen SHARP and expand the number of students in the Program. These eight sites participated in the Program: Ames Research Center North, Ames' Dryden Flight Research Facility, Goddard Space Flight Center, Goddard's Wallops Flight Facility, Kennedy Space Center, Langley Research Center, Lewis Research Center, and Marshall Space Flight Center. Author

81 ADMINISTRATION AND MANAGEMENT

Includes management planning and research.

N85-28850# Office of the Deputy Under Secretary of Defense for Research and Development (Research and Advanced Technology), Washington, D.C.
THE DEPARTMENT OF DEFENSE STATEMENT ON THE SCIENCE AND TECHNOLOGY PROGRAM BY COLONEL DONALD I. CARTER, USAF ACTING DEPUTY UNDER SECRETARY OF DEFENSE FOR RESEARCH AND ADVANCED TECHNOLOGY BEFORE THE SUBCOMMITTEE ON RESEARCH AND DEVELOPMENT OF THE COMMITTEE ON ARMED SERVICES OF THE UNITED STATES HOUSE OF REPRESENTATIVES, 99TH CONGRESS, FIRST SESSION
D. I. Carter 2 Apr. 1985 41 p
(AD-A152467; AD-E440273) Avail: NTIS HC A03/MF A01 CSCL 15/3

This congressional testimony describes our objectives for DoD S&T program, the role that it plays in the development and acquisition of materiel for the DoD, the relationship of S&T to the Soviet threat and the means by which the program is managed and executed in DoD. In addition, I will describe some of the specific programs that made up the DoD S&T program. Contents: Management Actions: DoD-University Relationships, University Research Instrumentation Program, University Research initiative, S&T Role in Export Control, Independent Research and Developemnt, Small Business Innovation Development Program, Consolidation of Computer Resources Management; Selected Fy 1986 Technical Programs: Software Initiatives, Very High Speed Integrated Circuits, Research, Materials and Structures, Aircraft Propulsion Technology, Advanced Aircraft Technology, Undersea Warfare, Missile Propulsion, Chemical Warfare Defense, Training and Personnel Systems Technology, Medical and Life Sciences,

Precision Guided Munitions, Search and Surveillance; Supporting Technologies: Geophysical Sciences and Global Environmental Support, The DoD Scientific and Technical Information Program.
GRA

N85-28851# Rome Air Development Center, Griffiss AFB, N.Y.
ROME DEVELOPMENT CENTER AIR FORCE TECHNICAL OBJECTIVE DOCUMENT C3I FY-86 Final Report
C. P. Crocetti Dec. 1984 65 p
(AF Proj. 06RA)
(AD-A152476; AD-E440273; RADC-TR-84-264; RADC-TOD-84-11) Avail: NTIS HC A04/MF A01 CSCL 05/1

This TOD describes the technical programs of the Rome Air Development Center in support of the Air Force Command, Control, Communications, and Intelligence (C3I) mission. The technical objectives have been aligned with the VANGUARD mission areas of Command, Control and Communications (C3), Reconnaissance and Intelligence, Strategic Systems (Defense) and Technology as a means of focusing the RADC support of VANGUARD. This document is prepared to provide industry and universities with the midterm technical objectives in these areas. GRA

N85-28852# Minnesota Univ., Minneapolis. Strategic Management Research Center.
CENTRAL PROBLEMS IN THE MANAGEMENT OF INNOVATION Interim Technical Report
A. H. Vande Van Dec. 1984 65 p
(Contract N00014-84-K-0016)
(AD-A152598; SMRC-DP-21; TR-7-ONR) Avail: NTIS HC A04/MF A01 CSCL 05/1

Innovation is defined as the development and implementation of new ideas by people who over time engage in transactions with others within an institutional order. This simple and seemingly innocuous definition has major implications for managing innovation. This definition focuses on four basic factors (new ideas, people, transactions, and institutional context). An understanding of how these factors are related lead to four basic problems confronting most general managers: (1) A human problem of managing attention, (2) A process problem in managing new ideas into good currency, (3) A structural problem of managing part-whole relationships, and (4) A strategic problem of institutional leadership. Appreciating these problems and their consequences provides a first step in developing a practical theory on the management of innovation. GRA

N85-28853# Minnesota Univ., Minneapolis. Strategic Management Research Center.
AN EXAMINATION OF ALTERNATIVE FORMS OF FIT IN CONTINGENCY THEORY Interim Technical Report
R. Drazin and A. H. Vande Van Nov. 1984 57 p
(Contract N00014-84-K-0016)
(AD-A152602; SMRC-DP-20; TR-3-ONR) Avail: NTIS HC A04/MF A01 CSCL 05/1

Contingency theories dominate scholarly studies of organization behavior, performance, planning, and management strategy. While varying widely in subject matter, they have at their core the common preposition that organizational performance results from the fit of context with design. Fit is the key concept in any contingency theory. This paper presents three concepts of fit: selection, interaction and systems approaches. These approaches are empirically compared using a contingency theory of work unit design. Implications for using multiple types of fit in contingency studies in general and for work level studies in particular are presented. GRA

N85-28854# Minnesota Univ., Minneapolis. Strategic Management Research Center.
THE CONCEPT OF FIT IN CONTINGENCY THEORY Interim Technical Report
A. H. Vande Ven and R. Drazin Nov. 1984 66 p
(Contract N00014-84-K-0016)
(AD-A152603; SMRC-DP-19; TR-5-ONR) Avail: NTIS HC A04/MF A01 CSCL 05/1

Contingency theories dominate scholarly studies of organization behavior, design, performance, planning and management strategy. While they vary widely in subject matter, they have the common proposition that an organizational outcome is the consequency of a fit or match between two or more factors. Fit is the key concept in this proposition, and the core problem common to contingency theories is not defining this term clearly. This paper examines three ways to define and test this concept of fit: Selection, Interaction, and Systems approaches. A critical discussion of these approaches will clarify much of the current confusion in the literature on contingency theories, and suggest ways that future theorizing and research can become more systematic and constructive. GRA

N85-28855# Air Force Wright Aeronautical Labs., Wright-Patterson AFB, Ohio.
AIR FORCE TECHNICAL OBJECTIVE DOCUMENT FY 86
W. E. Ward Dec. 1984 70 p Supersedes AD-A141 925
(AD-A152730; AD-E440275; AFWAL-TR-84-4000) Avail: NTIS HC A04/MF A01 CSCL 05/1

This Technical Objective Document which was prepared by the Materials Laboratory, describes the technical program in materials to meet future Air Force operational needs. The technology program is divided into ten focal areas which encompass the full spectrum of materials capabilities required for future aircraft, missile, space and electronic systems. These ten areas are Thermal protection materials and structures; Metallic structural materials; Nonmetallic structural materials; Nondestructive evaluation; Aerospace propulsion materials; Nonstructural materials; Electromagnetic windows and electronic materials; Laser hardened materials; Computer aided manufacturing/Manufacturing R&D; and Systems support. To ease the transition from previous format using Technology Planning Objectives (TPOs), the applicable TPO(s), and Task(s) are listed with each focal area. GRA

N85-28856# Stanford Univ., Calif. Dept. of Statistics.
SCIENCE AND TECHNOLOGY IN THE SOVIET UNION
31 Jan. 1985 222 p Conf. held in Stanford, Calif., 26-27 Jul. 1984
(Contract N00014-76-C-0475; NR Proj. 042-267)
(AD-A152828) Avail: NTIS HC A10/MF A01 CSCL 05/1

The theme of this Conference is the sociology of science and technology in the Soviet Union. It relates to the academic, industrial, and military settings in which research and development are initiated and developed and the process which these programs follow. These papers were prepared by experts in these subjects. There are nine papers plus introductory remarks and a forward. For individual titles, see N85-28857 through N85-28865.

N85-28857# RAND Corp., Santa Monica, Calif.
SOVIET WEAPONS DEVELOPMENT AND THE SCIENTIFIC COMMUNITY
A. J. Alexander *In* Stanford Univ. Sci. and Technol. in the Soviet Union 31 Jan. 1985 p 7-40 (For primary document see N85-28856 17-81)
(AD-P004562) Avail: NTIS HC A10/MF A01 CSCL 05/1

Various topics relative to Soviet weapons development are discussed. Development of the Soviet T-34 tanks, organizations in Soviet weapons R/D and science, Soviet weapons acquisition process, characteristics of Soviet weapon design, science ties to the Soviet military, types of linkages between science and the military, nature of scientific support, and the three components of Soviet military R/D. are topics discussed. R.J.F.

N85-28858# Arizona State Univ., Tempe.
COMPUTING IN THE SOVIET GENERAL ECONOMY: AN INTRODUCTORY OVERVIEW c61
S. E. Goodman and W. K. McHenry *In* Stanford Univ. Sci. and Technol. in the Soviet Union 31 Jan. 1985 p 41-52 (For primary document see N85-28856 17-81)
(AD-P004563) Avail: NTIS HC A10/MF A01 CSCL 05/1

The use of computers in the soviet economy is discussed.

General purpose computing in the USSR, computing in the Soviet economy, and technology transfer are covered. R.J.F.

N85-28859# RAND Corp., Santa Monica, Calif.
THE OUTLOOK FOR SOVIET ADVANCED TECHNOLOGIES
S. Kassel *In* Stanford Univ. Sci. and Technol. in the Soviet Union 31 Jan. 1985 p 53-69 (For primary document see N85-28856 17-81)
(AD-P004564) Avail: NTIS HC A10/MF A01 CSCL 05/1

The author believes that the future performance of Soviet advanced technologies depends to a large extent on a single organization, the Soviet Academy of Science, an R/D performer in the majority of areas significant to advanced technologies. He focuses on the Academy and the reasons why he considers it pivotal to Soviet technological development. This leads directly to the much discussed topic of industrial innovation and the impediments that characterize the Soviet R/D system. GRA

N85-28860# American Univ., Washington, D. C.
SOCIAL AND POLITICAL PROBLEMS IN SOVIET BASIC RESEARCH
L. L. Lubrano *In* Stanford Univ. Sci. and Technol. in the Soviet Union 31 Jan. 1985 p 71-95 (For primary document see N85-28856 17-81)
(AD-P004565) Avail: NTIS HC A10/MF A01 CSCL 05/1

The impact by social and political factors on Soviet based research is discussed. Policy implications, decisionmaking in the USSR academy, and politics and furman flights are discussed. GRA

N85-28861# Johns Hopkins Univ., Baltimore, Md. School of Advanced International Studies.
TECHNOLOGY AND SOVIET POLITICAL CHOICES
B. Parrott *In* Stanford Univ. Sci. and Technol. in the Soviet Union 31 Jan. 1985 p 97-106 (For primary document see N85-28856 17-81)
(AD-P004566) Avail: NTIS HC A10/MF A01 CSCL 05/1

The purpose of this paper is to survey, from an historical perspective, how technological considerations have figured in Soviet political choices. The paper focuses on two specific issues: (1) Soviet interpretations of the technological and military competition with the West, and (2) Soviet attitudes toward the utilization of Western technology. GRA

N85-28862# North Carolina Univ., Chapel Hill.
TECHNOLOGY AND TECHNICAL EFFICIENCY IN THE SOVIET UNION: DOMINANT PATTERNS OF CONSTRAINED OPTIMIZATION IN A NONCOMPETITIVE ECONOMIC REGIME
S. Rosefielde *In* Stanford Univ. Sci. and Technol. in the Soviet Union 31 Jan. 1985 p 107-124 (For primary document see N85-28856 17-81)
(AD-P004567) Avail: NTIS HC A10/MF A01 CSCL 05/1

This essay focuses on three issues. It attempts to show that the Soviet economic system does not foster technical inefficiency, although it does cause interfirm and intersectoral factor misallocational. Second, it is argued that the principal cause of technological distortion in the Soviet regime is the institutionalization of noncompetitiveness, a phenomena closely associated with the abolition to private ownership of the means of production. And, third it is maintained, on theoretical grounds, that the technological losses borne by the system fall primarily on the civilian consumer sector, leaving military technology relatively unimpaired. It is concluded that system-induced technological shortcoming will not significantly impede aggregate Soviet growth or the continuous improvement of Soviet weapons capabilities in the Eighties. GRA

N85-28863# Stanford Univ., Calif.
THE REVOLUTION IN MILITARY AFFAIRS AND THE SOVIET SYSTEM
C. Rice *In* Stanford Univ. Sci. and Technol. in the Soviet Union 31 Jan. 1985 p 125-154 (For primary document see N85-28856 17-81)
(AD-P004568) Avail: NTIS HC A10/MF A01 CSCL 05/1

The development of the Soviet military is Surveyed. Mikhail Tukhachevsky and the First Revolution in the Soviet armed forces, the transformation of Soviet military power in the Nuclear Age, and the next revolutionary frontiers are among the topics discussed. R.J.F.

N85-28864# Hewlett-Packard Labs., Palo Alto, Calif.
CLOSE ENCOUNTERS WITH S/T (SCIENCE AND TECHNOLOGY) IN THE SOVIET UNION
E. E. Loebner *In* Stanford Univ. Sci. and Technol. in the Soviet Union 31 Jan. 1985 p 179-214 (For primary document see N85-28856 17-81)
(AD-P004570) Avail: NTIS HC A10/MF A01 CSCL 05/1

This paper attempts to convey a number of personnel observations, impressions and conclusions gathered and formulated during a two-year Foreign Service assignment at the American Embassy in Moscow. The author was Chief of the Embassy's Science and Technology Section during the Ford Administration. He discusses the organizational structure of US-SU cooperation in S/T. After examples of S/T cooperation, he then attempts to explain a number of important differences between doing science in the SU and in the US. Attention is also paid to those peculiarities of Soviet management that seem to impact industrial practices and could contribute to slowing the rate of innovation and modernization. GRA

N85-28865# Commerce Dept., Washington, D.C.
R/D CONTRACTS IN THE SOVIET UNION
J. A. Martens *In* Stanford Univ. Sci. and Technol. in the Soviet Union 31 Jan. 1985 p 155-178 (For primary document see N85-28856 17-81)
(AD-P004569) Avail: NTIS HC A02/MF A01 CSCL 05/1

This paper examines the evolution of research and development contracting in the post World War II Soviet Union. In particular, the paper analyzes the legal and economic discussions that accompanied numerous changes in the rules for R/D contracts in light of Soviet goals for improving the research, development and innovation performance of the economy. GRA

N85-28866# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
COMPLETE DEVELOPMENT AND IMPLEMENT AFIT/ENG DATABASE MANAGEMENT SYSTEM, VOLUME 1 M.S. Thesis
M. E. Pangman Dec. 1984 237 p
(AD-A153043; AFIT/GCS/ENG/84D-20-Vol-1) Avail: NTIS HC A11/MF A01 CSCL 05/1

This study undertook a complete revision and redesign of the AFIT/ENG database in an effort to expand existing capabilities and utilities. The Software Development Life Cycle approach was utilized throughout this project in order to provide a basis for sound database development base. The initial compilation of data was obtained by interviewing a wide range of individuals to determine essentials needed functions as well as requested data requirements. The results were combined to form the specific network master and variable data-sets for use with anticipated application programs for a greater data base utility. The expanded database exhibits the means to manipulate student and faculty as well as to provide for the inclusion of advanced data handling routines like Education Plan and Graduate Credit Record utilities. To insure standard data input and output as well as provide a more user friendly environment, a menu form display technique was incorporated within the expanded database driver. GRA

N85-28867# Michigan State Univ., East Lansing. Dept. of Psychology.
LABORATORY RESEARCH: A QUESTION OF WHEN, NOT IF Interim Report
D. R. Ilgen Mar. 1985 28 p
(Contract N00014-83-K-0756)
(AD-A153298; TR-85-1; Rept-2006) Avail: NTIS HC A03/MF A01 CSCL 05/1

Laboratory research is discussed in terms of the contribution of laboratory research to knowledge at any given time. Research

is viewed as a process of trade-offs. When viewed from this perspective, it is argued that frequently laboratory research may have high utility for addressing problems relevant in the field. Dimensions or classes of trade-offs are addressed. These are: experimental setting fidelity, replication, constraints, threats to health and safety, research not possible in the field, and feasibility. GRA

N85-28868# California Univ., Livermore. Lawrence Livermore Lab.
ENERGY AND TECHNOLOGY REVIEW
Nov. 1984 43 p refs
(Contract W-7405-eng-48)
(DE85-004358; UCRL-52000-84-11) Avail: NTIS HC A03/MF A01

Articles on the MARS fusion reactor, electromagnetic coupling of high-altitude nuclear electromagnetic pulses, and dosimetry estimates for Hiroshima and Nagasaki are presented. DOE

N85-28869# California Univ., Berkeley. Lawrence Berkeley Lab.
CATALOG OF RESEARCH PROJECTS AT LAWRENCE BERKELEY LABORATORY, 1985
1985 117 p
(Contract DE-AC03-76SF-00093)
(DE85-008679; LBL-PUB-477) Avail: NTIS HC A06/MF A01

This Catalog has been created to aid in the transfer of technology from the Lawrence Berkeley Laboratory to potential users in industry, government, Universities, and the public. The projects are listed for the following LBL groups: Accelerator and Fusion Research Division, Applied Science Division, Biology and Medicine Division, Center for Advanced Materials, Chemical Biodynamics Division, Computing Division, Earth Sciences Division, Engineering and Technical Services Division, Materials and Molecular Research Division, Nuclear Science Division, and Physics Division. DOE

N85-28870# Technische Hogeschool, Delft (Netherlands). Dept. of Mathematics and Informatics.
MULTICRITERIA DECISION ANALYSIS AS AN AID TO STRATEGIC PLANNING OF ENERGY RESEARCH AND DEVELOPMENT
F. A. Lootsma, J. Meisner (Shell Research BV, Amsterdam), and F. Schellemans (Energy Research Council, Hague) 1984 53 p refs
(Rept-84-02) Avail: NTIS HC A04/MF A01

The use of multicriteria decision analysis as an aid for an advisory council to select areas of interest for government-financed Energy R&D subject to a budget constraint is described. A way of comparing the anticipated impact of energy R&D in different technological areas based on the opinions of the council members given a number of judgment criteria is outlined. Maximizing the overall impact of an R&D program for a given level of expenditure is explained. It is shown how the decision model can be used as a discussion model highlighting the points of agreement and disagreement among council members. Author (ESA)

N85-28871# National Aerospace Lab., Amsterdam (Netherlands).
TECHNICAL SERVICES AT NLR
1983 19 refs
(B8561898) Avail: NTIS HC A02/MF A01

The organization and activities of the technical design department, technical projects department, and workshops of the Netherlands National Aerospace Laboratory are outlined. Author (ESA)

N85-28872# Joint Publications Research Service, Arlington, Va.
USSR REPORT: SCIENCE AND TECHNOLOGY POLICY
8 May 1985 114 p refs Transl. into ENGLISH from various Russian articles
(JPRS-UST-85-008) Avail: NTIS HC A06/MF A01

Articles on the organization, planning and coordination of technology are presented. Also contained are the subject areas of budget and finance, automation and information policy, patents and inventions, and general news in the science and technology of the U.S.S.R. For individual titles, see N85-28873 through N85-28875.

N85-28873# Joint Publications Research Service, Arlington, Va.
ORGANIZATION OF SCIENTIFIC, TECHNICAL INFORMATION SERVICES **c82**
O. Glazov *In its* USSR Rept.: Sci. and Technol. Policy (JPRS-UST-85-008) 8 May 1985 p 71-74 Transl. into ENGLISH from Leniskoye Znamya (Moscow), 14 Jul. 1984 p 2 (For primary document see N85-28872 17-81)
Avail: NTIS HC A06/MF A01

The reasons for the need for divisions of scientific and technical information are discussed. The work of this division and it's organization is outlined. Also mentioned is the explosion of information and how it threatens to drown the scientist. E.R.

N85-28874# Joint Publications Research Service, Arlington, Va.
ACADEMICIAN OVCHINNIKOV ON FUTURE OF BIOORGANIC CHEMISTRY **c23**
Ye. Manchurova and M. Khromchenko *In its* USSR Rept.: Sci. and Technol. Policy (JPRS-UST-85-008) 8 May 1985 p 78-83 Transl. into ENGLISH from Izv. (Moscow), 4 Jan. 1985 p 3 (For primary document see N85-28872 17-81)
Avail: NTIS HC A06/MF A01

A U.S.S.R. scientist speculates on the direction in which research of chemists, biologists and physicists will take. He speaks about the isolation of peptides in the brain. He theorizes on the role of these peptides in the brain and how scientist will experiment with it by adding to the molecule and shortening it thereby seeing how these changes affects its role in the drain. E.R.

N85-28875# Joint Publications Research Service, Arlington, Va.
GENERAL LAWS OF DEVELOPMENT OF TECHNOLOGY
T. Lekhtla *In its* USSR Rept.: Sci. and Technol. Policy (JPRS-UST-85-008) 8 May 1985 p 89-93 Transl. into ENGLISH from Sovetskaya Estoniya (Tallinn), 2 Nov. 1984 p 2 (For primary document see N85-28872 17-81)
Avail: NTIS HC A06/MF A01

The general development of machines is outlined. How man and machines interact and affect each others existance is discussed. The development of technology follows the general laws of dialectics, and technical systems development proceed in a spiral. The understanding of the essence of what is happening help to make long range decisions and to identify mistakes in time. E.R.

82 DOCUMENTATION AND INFORMATION SCIENCE

Includes information storage and retrieval technology; micrography; and library science.

For computer documentation see *61 Computer Programming and Software.*

N85-28876*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
BIBLIOGRAPHY OF LEWIS RESEARCH CENTER TECHNICAL PUBLICATIONS ANNOUNCED IN 1984
May 1985 322 p
(NASA-TM-87012; E-2556; NAS 1.15:87012) Avail: NTIS HC A14/MF A01 CSCL 05B

This compilation of abstracts describes and indexes the technical reporting that resulted from the scientific and engineering work performed and managed by the Lewis Research Center in 1984. All the publications were announced in the 1984 issues of STAR (Scientific and Technical Aerospace Reports) and/or IAA (International Aerospace Abstracts). Included are research reports, journal articles, conference presentations, patents and patent applications, and theses. Author

N85-28877*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
EXPERIMENTAL PHILOSOPHY LEADING TO A SMALL SCALE DIGITAL DATA BASE OF THE CONTERMINOUS UNITED STATES FOR DESIGNING EXPERIMENTS WITH REMOTELY SENSED DATA
M. L. Labovitz, E. J. Masuoka, P. W. Broderick, T. R. Garman, R. W. Ludwig, G. N. Beltran, P. J. Heyman, and L. K. Hooker Apr. 1983 22 p refs
(NASA-TM-85009; NAS 1.15:85009) Avail: NTIS HC A02/MF A01 CSCL 05B

Research using satellite remotely sensed data, even within any single scientific discipline, often lacked a unifying principle or strategy with which to plan or integrate studies conducted over an area so large that exhaustive examination is infeasible, e.g., the U.S.A. However, such a series of studies would seem to be at the heart of what makes satellite remote sensing unique, that is the ability to select for study from among remotely sensed data sets distributed widely over the U.S., over time, where the resources do not exist to examine all of them. Using this philosophical underpinning and the concept of a unifying principle, an operational procedure for developing a sampling strategy and formal testable hypotheses was constructed. The procedure is applicable across disciplines, when the investigator restates the research question in symbolic form, i.e., quantifies it. The procedure is set within the statistical framework of general linear models. The dependent variable is any arbitrary function of remotely sensed data and the independent variables are values or levels of factors which represent regional climatic conditions and/or properties of the Earth's surface. These factors are operationally defined as maps from the U.S. National Atlas (U.S.G.S., 1970). Eighty-five maps from the National Atlas, representing climatic and surface attributes, were automated by point counting at an effective resolution of one observation every 17.6 km (11 miles) yielding 22,505 observations per map. The maps were registered to one another in a two step procedure producing a coarse, then fine scale registration. After registration, the maps were iteratively checked for errors using manual and automated procedures. The error free maps were annotated with identification and legend information and then stored as card images, one map to a file. A sampling design will be accomplished through a regionalization analysis of the National Atlas data base (presently being conducted). From this analysis a map of homogeneous regions of the U.S.A. will be created and samples (LANDSAT scenes) assigned by region.
R.J.F.

N85-28878# Defense Technical Information Center, Alexandria, Va.
A STUDY OF USER-DEFINED SEARCHING REQUIREMENTS FOR THE ON-LINE VERSION OF THE DIRECTORY OF DOD-SPONSORED R AND D DATA BASES ON THE DEFENSE GATEWAY COMPUTER SYSTEM Final Report
G. C. Chastain Mar. 1985 141 p
(AD-A153000; DTIC/TR-85/1) Avail: NTIS HC A07/MF A01 CSCL 09/2

In anticipation of the implementation of the Directory of DOD-Sponsored R&D Data Bases in an on-line version on the Defense Gateway Computer System (hereafter the Gateway), a study was undertaken to identify the searching requirements of existing and potential users. The terms user-friendly interface, natural language front-end processor, and expert system are defined. The procedure followed in conducting the study is described. Results of the study are presented along with a recommendation for an interface to be incorporated into the Gateway for searching the on-line version of the directory. The plan for this study was to contact a sample group of people who were familiar with the directory to ask them how they used the print directory, and try to determine their searching requirements for an on-line version of the directory. A questionnaire was used to gather this information. This instrument was chosen to define and standardize the information that would be gathered. This standardization served to increase reliability and facilitate analysis of the results. GRA

N85-28879# Advanced Technology, Inc., Reston, Va.
DLA: DATA/DATA BASE ADMINISTRATION ANALYSIS Final Report
R. Girouard 26 Feb. 1985 134 p
(Contract DLAH00-83-D-0225)
(AD-A153031) Avail: NTIS HC A07/MF A01 CSCL 05/2

The scope of this study addresses the following three questions: What Data/Data Base Administration (D/DBA) functions have to be performed to effectively manage the D/DBA environment in DLA? What tools are needed to support the D/DBA functions? What is the required organizational structure for the functions and tools and where should they be located throughout DLA? The goal of this study is to conduct an extensive review and assessment of existing Data/Data Base Administration methods and procedures to develop concepts, directions, and an organizational approach in accomplishing the management of automated information DLA wide. GRA

N85-28880# Army Research Inst. for the Behavioral and Social Sciences, Alexandria, Va.
VERBAL INFORMATION PROCESSING PARADIGMS: A REVIEW OF THEORY AND METHODS
K. J. Mitchell Sep. 1984 35 p
(DA Proj. 2Q1-62722-A-791)
(AD-A153229; ARI-TR-648) Avail: NTIS HC A03/MF A01 CSCL 09/4

The theory and research methods of selected verbal information processing paradigms are reviewed. Work in factor analytic, information processing, chronometric analysis, componential analysis, and cognitive correlates psychology is discussed. The definition and measurement of cognitive processing operations, stores, and strategies involved in performance on verbal test items and test-like tasks is documented. Portions of the reviewed verbal processing paradigms are synthesized and a general model of text processing is presented. The model was used as a conceptual framework for subsequent analyses of the construct and predictive validity of the verbal subtests of the Armed Services Vocational Aptitude Battery. GRA

N85-28881# Department of Energy, Oak Ridge, Tenn. Office of Scientific and Technical Information.
ENERGY DATA BASE: SUBJECT CATEGORIES AND SCOPE
David E. Bost Mar. 1985 65 p
(DE84-017376; DOE/TIC-4584/R6) Avail: NTIS HC A04/MF A01

The subject scope of the Energy Data Base (EDB) encompasses all DOE-sponsored research. Broadly defined, EDB subject scope includes all technological aspects of energy production, conversion, and efficient utilization, and the economic, social, and political aspects as well. Scope notes are provided to define the extent of interest in certain subject areas, particularly areas of basic research. Cross references between categories are provided to aid both the categorization of information and its retrieval. Citations entered into DOE's computerized bibliographic information system are assigned six-digit subject category numbers to broadly group information for storage, retrieval, and manipulation. These numbers are used in the preparation of printed documents, such as bibliographies and abstract journals, to arrange the citations and to aid searching on the DOE/RECON on-line system. DOE

N85-28882# Kernforschungsanlage, Juelich (West Germany).
ORIGIN, PROCESSING, AND DISSEMINATION OF SCIENTIFIC NEWS, WITH EXAMPLES FROM 20 RESEARCH INSTITUTES [ENTSTEHUNG, VERARBEITUNG UND VERBREITUNG VON WISSENSCHAFTSNACHRICHTEN AM BEISPIEL VON 20 FORSCHUNGSEINRICHTUNGEN]
H. P. Peters Aug. 1984 326 p refs In GERMAN; ENGLISH summary
(JUEL-1940; ISSN-0366-0885) Avail: NTIS HC A15/MF A01

Factors influencing the flow of news from scientific communities to the mass media, in particular the role of scientific organizations and their public relations efforts in that process are identified. Material for public relation activities is selected according

to three criteria: journalistic norms, interests and goals of the organization, and the amount of work necessary to collect the information from scientists and to prepare it for journalists. Nonuniversity research organizations tend to concentrate their public relations in specialized departments to a higher degree than universities, where scientists themselves do a lot of public relations work. At least four criteria influence the selection by daily newspapers: reference to an actual topic, relevance for the individual reader or society, spatial distance between site of research organization and site of newspaper, and existence of personal contacts between public relations officials and journalists. Author (ESA)

N85-28883# National Aerospace Lab., Amsterdam (Netherlands). Space Div.
THE IRAS END-TO-END DATA SYSTEM
R. C. vanHoltz 19 Aug. 1983 10 p refs Presented at ESA/ESTEC Software Eng. Seminar. Noordwijk, Netherlands, 11-14 Oct. 1983 Previously announced as N84-14763
(NLR-MP-83056-U; B8561056) Avail: NTIS HC A02/MF A01

The design and development of the Infrared Astronomy Satellite data system are described. The end-to-end data system approach is assessed in the light of 6 months operational experience. Areas where further application of the principle probably would be beneficial are indicated. Author (ESA)

N85-28884# National Aerospace Lab., Amsterdam (Netherlands).
THE DEVELOPMENT OF INFORMATION SYSTEMS AT NLR
1983 13 p In DUTCH; ENGLISH summary Sponsored by Netherlands Agency for Aerospace Programs
(B8580079) Avail: NTIS HC A02/MF A01

A formalized approach to the development of information systems to avoid technical and organizational problems is given. A feasibility study is carried out. In the preliminary system a choice has to be made of several possible systems. The functional system consists of the structured users' requirements. From the functional system, the technical system is derived; first a concept is made, then the elements are designed in detail, and translated into instructions on how to make programs, equipment, and structures. Author (ESA)

N85-28873# Joint Publications Research Service, Arlington, Va.
ORGANIZATION OF SCIENTIFIC, TECHNICAL INFORMATION SERVICES
O. Glazov *In its* USSR Rept.: Sci. and Technol. Policy (JPRS-UST-85-008) 8 May 1985 p 71-74 Transl. into ENGLISH from Leniskoye Znamya (Moscow), 14 Jul. 1984 p 2 (For primary document see N85-28872 17-81)
Avail: NTIS HC A06/MF A01

83 ECONOMICS AND COST ANALYSIS

Includes cost effectiveness studies.

No abstracts in this category.

84 LAW AND POLITICAL SCIENCE

Includes space law; international law; international cooperation; and patent policy.

N85-28885# Committee on Commerce, Science, and Transportation (U. S. Senate).
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION AUTHORIZATION ACT, 1986
Washington GPO 1985 29 p H. R. 1714, an act, referred to the Comm. on Com., Sci., and Transportation, 99th Congr., 1st Sess., 16 Apr. 1985 (S-Rept-99-91) Avail: US Capitol, Senate Document Room

An act to authorize appropriations for various NASA programs is given. Research and development, space flight, control and data communications, construction and maintenance of facilities, and project management are among the purposes for which the authorization was written. R.J.F.

N85-28886# Bundesministerium fuer Forschung und Technologie, Hamburg (West Germany).
DOCUMENTATION FOR THE WEST GERMAN FEDERAL CABINET'S SPACE POLICY DECISION [UNTERLAGEN ZUR ENTSCHEIDUNG DES BUNDESKABINETTS ZUR WELTRAUMPOLITIK]
Greger Apr. 1985 33 p In GERMAN
Avail: NTIS HC A03/MF A01

The financial and technical contribution of the German government to the Columbus program and the HM 60/Ariane 5 program as well as the time schedule are presented. The different programs and the NASA space station are described. The importance of the NASA space station for Europe is studied in its scientific, technological, financial and political aspects. Author (ESA)

85 URBAN TECHNOLOGY AND TRANSPORTATION

Includes applications of space technology to urban problems; technology transfer; technology assessment; and surface and mass transportation.

For related information see *03 Air Transportation and Safety, 16 Space Transportation,* and *44 Energy Production and Conversion.*

N85-28887*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
ADVANCED VEHICLE SYSTEMS ASSESSMENT. VOLUME 1: EXECUTIVE SUMMARY
Keith S. Hardy Jan. 1985 30 p
(Contracts NAS7-918; DE-AI01-78CS-54209)
(NASA-CR-175876; DOE/CS-54209/22; JPL-503-573-Vol-1; JPL-Pub-84-79-Vol-1; NAS 1.26:175876) Avail: NTIS HC A03/MF A01 CSCL 13F

An evaluation of advanced electric and hybrid vehicles for potential development by the early 1990s is given. The primary objective of the assessment is to recommend subsystem research priorities based on a comparison of alternatives as part of complete vehicle systems with equivalent performance. The assessment includes evaluations of candidate technologies as well as technical and economic comparisons of vehicle systems for specified missions. The availability of nonpetroleum fuel is also addressed, and preference analyses are used to assist in the evaluation of the relative merits of competing systems. R.J.F.

N85-28888# Edgerton, Germeshausen and Grier, Inc., Idaho Falls, Idaho.
TEST PLAN FOR ACCEPTANCE, VERIFICATION AND PERFORMANCE TESTING OF THE BEDFORD LUCAS CHLORIDE ELECTRIC VAN. PART 1: ACCEPTANCE AND VERIFICATION TESTING AT EG AND G AUTOMOTIVE RESEARCH. PART 2: INEL PERFORMANCE TESTING, REVISION 1
H. E. Knauts, H. W. Heiselmann, and R. D. MacDowall Nov. 1984 137 p refs
(Contract DE-AC07-76ID-01570)
(DE85-005157; EGG-SE-6750-Rev-1) Avail: NTIS HC A07/MF A01

The acceptance and verification tests of part 1, were performed in accordance with the society of Automotive Engineers (SAE) Electric Vehicle Test Procedure J227a, and are intended to demonstrate conformance with Title 10, Part 475 of the US Code of Federal Regulations (10 CFR 475). Environmental tests were performed. The performance testing, of part 2, was performed at

the Electric Vehicle Testing Laboratory of Idaho Falls, Idaho. These tests were also performed in accordance with the SAE J227a procedure and are primarily dynamometer tests that are intended to provide performance data under controlled laboratory conditions. These tests include vehicle gradability at speed, gradability limit, acceleration, forward speed capability, regenerative braking, braking distance, range and coastdown. DOE

N85-28889# Carl (Willard C.), Russellville, Tenn.
URBAN VEHICLE RESEARCH PROJECT
W. C. Carl Mar. 1984 23 p refs
(Contract DE-FG44-80R4-10280)
(DE85-005444; DOE/OR-21400/T80) Avail: NTIS HC A02/MF A01

The project's main goal of high energy efficiency in a four passenger vehicle was approached from two directions. (1) Try a hybrid electric drive system with the stationary internal combustion engine powered by locally produced alcohol and compare its convenience and efficiency to contemporary vehicles. (2) Build a light, aerodynamically clean vehicle body to package all the components plus four adults and make this package aesthetically appealing. Half of the project's original purpose was successful - the construction of a handsome body with a drag coefficient of a .16 and a weight of 1230 lbs that comfortably seats four adults. The problem area was the electrical portion of the vehicle. The electric parts take constant maintenance and cleaning compared with today's conventional vehicle. The use of alcohol as an alternate fuel was trouble free. The normal drag of current autos is approximately .54. The final body configuration built for this project has a drag of .16 to .18. With conventional power, this drag coefficient should give a doubling of current miles per gallon. DOE

N85-28890# Department of Energy, Washington, D. C. Assistant Secretary for Conservation and Renewable Energy.
REPORT TO CONGRESS ON THE AUTOMOTIVE TECHNOLOGY DEVELOPMENT PROGRAM Annual Report
14 Sep. 1984 25 p refs
(DE85-005640; DOE/CE-0027/3; AR-6) Avail: NTIS HC A02/MF A01

The DOE's transportation energy programs focus on R and D of energy efficient technologies that are unlikely to be undertaken by the private sector alone. Prior government-sponsored R and D programs identified the gas turbine and Stirling engines as development candidates. These engines are the focus of the automotive technology development program described. Other areas of concentrated R and D are heavy duty transport technology and advanced materials development. DOE

88 SPACE SCIENCES (GENERAL)

N85-28891# Wuerzburg Univ. (West Germany). Lehrstuhl Astronomie.
[ACTIVITIES REPORT OF THE INSTITUTE OF ASTRONOMY AND ASTROPHYSICS] Annual Report, 1983 [INSTITUT FUER ASTRONOMIE UND ASTROPHYSIK, 1983]
1983 4 p refs In GERMAN
Avail: NTIS HC A02/MF A01

Solar physics (solar granulation, short period oscillations); stellar atmosphere and stellar structure (sound generation, convection zone); and extragalactic astronomy (photometry in the Large Magellanic Cloud) were studied. Author (ESA)

N85-28892# Wuerzburg Univ. (West Germany). Lehrstuhl Astronomie.
[ACTIVITIES REPORT OF THE INSTITUTE OF ASTRONOMY AND ASTROPHYSICS] Annual Report, 1984 [JAHRESBERICHT (1984)]
1984 6 p refs In GERMAN
Avail: NTIS HC A02/MF A01

Solar physics; solar granulation; helioseismology; solar oscillations; stellar atmosphere; stellar structure; dynamic atmospheric models; brightness variation of supergiant stars in the Large Magellanic Cloud; extragalactic astronomy; brightness distribution; mathematical models for galaxy evolution; and photometry are discussed. Author (ESA)

89 ASTRONOMY

Includes radio and gamma-ray astronomy; celestial mechanics; and astrometry.

N85-28893*# Lockheed Missiles and Space Co., Palo Alto, Calif.
LONG LIFE FEASIBILITY STUDY FOR THE SHUTTLE INFRARED TELESCOPE FACILITY
Jun. 1985 185 p
(Contract NAS2-11155)
(NASA-CR-3722; NAS 1.26:3722; LMSC-D877125) Avail: NTIS HC A09/MF A01 CSCL 03A

A study was conducted to assess the feasibility of designing an Infrared Telescope of the 1 meter class which would operate effectively as a Shuttleborne, 14-day Spacelab payload and then be adapted with little modification to work as a 6 month Space station or free flyer payload. The optics configuration and requirements from a previous study were used without modification. In addition, an enhancement to 2 year mission lengths was studied. The cryogenic system selected was a hybrid design with an internal solid Hydrogen tank at 8 Kelvin and an internal superfluid tank at 2K. In addition to the cryogenic design, a detailed look at secondary mirror actuators for chopping, focus and decenter was conducted and analysis and cryo test reported. Author

N85-28894# California Inst. of Tech., Pasadena.
A NEW LUMINOSITY COMPONENT IN 3C48
G. Neugebauer, B. T. Soifer, and G. K. Miley (Space Telescope Science Inst., Baltimore, Md.) 1985 19 p refs Sponsored in part by NASA and NSF
(NASA-CR-175840; NAS 1.26:175840) Avail: NTIS HC A02/MF A01 CSCL 03A

The infrared emission from the quasar 3C48 has a luminosity L approximately 5X10 to the 12th power solar luminosity and dominates the power output of the quasar system. It is shown that the infrared emission, unlike that of most radio loud quasars, is most likely not an extension of the radio emission of the quasar. It is argued that the infrared emission in 3C48 is probably thermal radiation arising in a highly luminous galaxy surrounding the quasar. Author

N85-28895*# Dartmouth Coll., Hanover, N.H. Dept. of Physics and Astronomy.
OPTICAL OBSERVATIONS OF HEAO-B OBJECTS
Delo E. Mook [1985] 5 p
(Grant NAG8-305)
Avail: NTIS HC A02/MF A01 CSCL 03A

Positions and error circles of optically unidentified X-ray sources near the galactic plane were used to carry out searches within and around the error circles for optical counterparts for these sources. Forty-nine X-ray fields were searched in the course of 42 nights of observation and 62 individual stellar objects were studied. No optical identifications of the X-ray sources were made. R.J.F.

N85-28896*# Utah Univ., Salt Lake City. Department of Meteorology.
AN EXPERIMENTAL INVESTIGATION OF THE ANGULAR SCATTERING AND BACKSCATTERING BEHAVIORS OF THE SIMULATED CLOUDS OF THE OUTER PLANETS Final Report
Kenneth Sassen 30 Sep. 1984 44 p refs
(Grant NAGw-82)
(NASA-CR-175909; NAS 1.26:175909) Avail: NTIS HC A03/MF A01 CSCL 03A

A cryogenic, 50 liter volume Planetary Cloud Simulation

Chamber has been constructed to permit the laboratory study of the cloud compositions which are likely to be found in the atmospheres of the outer planets. On the basis of available data, clouds composed of water ice, carbon dioxide, and liquid and solid ammonia and methane, both pure and in various mixtures, have been generated. Cloud microphysical observations have been permitted through the use of a cloud particle slide injector and photomicrography. Viewports in the lower chamber have enabled the collection of cloud backscattering data using 633 and 838 nm laser light, including linear depolarization ratios and complete Stokes parameterization. The considerable technological difficulties associated with the collection of angular scattering patterns within the chamber, however, could not be completely overcome. Author

N85-28897# Max-Planck-Inst. fuer Physik und Astrophysik, Garching (West Germany). Inst. fuer Extraterrestrische Physik.
OBSERVATION OF THE CRAB NEBULA IN THE HARD X-RAY [BEOBACHTUNG DES CRAB IM HARTEN ROENTGENLICHT]
Guenther Hasinger Dec. 1984 113 p refs In GERMAN
(MPE-186) Avail: NTIS HC A06/MF A01

Astronomical observations of the Crab nebula were performed in the hard X-ray domain in the balloon experiment High Energy X-ray Experiment (HEXE). The balloon experiment, the detector systems with which it is equipped, and the behavior of the instruments during the three balloon flights are described. The Crab global power spectrum clearly shows a bend at 82 (+ or - 8) keV. Pulsar analysis shows a very strong signal in the radio period; the time-averaged high energy spectrum has a bend at 63 (+ or - 30) keV. Pulse phase spectroscopy reveals a systematic variation of the spectral index versus phase, in the sense that the spectra between peaks are harder than those of both pulses; the power spectrum bends at 41 (+ or - 10) keV. For the pulse form analysis, asymmetric modified Lorentz curves well represent the measured spectra; the pulse form parameters systematically vary with frequency and show extreme values in the hard X-ray domain. Theoretical Crab pulsar items (pulsar magnetosphere, plasma in the neighborhood of the light cylinder, relativistic compression, polarization) are discussed. Author (ESA)

N85-28898# Max-Planck-Inst. fuer Physik und Astrophysik, Garching (West Germany). Inst. fuer Extraterrestrische Physik.
[ACTIVITIES REPORT OF THE INSTITUTE FOR EXTRATERRESTRIAL PHYSICS] Annual Report, 1984 [INSTITUT FUER EXTRATERRESTRISCHE PHYSIK - TAETIGKEITSBEREICH]
Jan. 1985 120 p refs In GERMAN Original contains color illustrations
(MPI-PAE/Extraterr-187; ISSN-0173-699X) Avail: NTIS HC A06/MF A01

The ionosphere and auroras; the passive plasma experiment AMPTE; the magnetosphere and solar wind; and energetic ions and electrons in the magnetosphere and interplanetary space were studied. Infrared astronomy investigations comprise astronomical observations, development of observation systems, and theoretical work. In the field of X-ray astronomy astronomical observations, development of observation systems, laboratory investigations, and theoretical work were performed. The gamma astronomy investigations comprise flare and burst events, low energy gamma astronomy, high energy gamma astronomy, and theoretical work. Molecular spectroscopy investigations were performed.
Author (ESA)

N85-28899# Max-Planck-Inst. fuer Physik und Astrophysik, Garching (West Germany). Inst. fuer Extraterrestrische Physik.
BALLOON-BORNE, He-COOLED FOURIER TRANSFORM SPECTROMETER FOR FAR INFRARED ASTRONOMY
M. F. Campbell (Colby Coll.) and S. Drapatz Feb. 1985 59 p refs
(MPE-IR-41; ISSN-0340-8922) Avail: NTIS HC A04/MF A01

Mounting a prototype version of the helium cooled German Infrared Laboratory (GIRL) spacelab Fourier transform spectrometer (FTS) on a balloon borne 1 m infrared telescope, and on a three-axis stabilized platform is proposed. The Michelson FTS utilizes both outputs. A Fabry-Perot masking filter passes radiation to the FTS only in bands containing lines of astrophysical interest. The reduction of the telescope atmospheric background radiation by the masking filters, and elimination of internal radiation of the FTS due to its low temperature allow operation within the passband of each masking filter at a level where multiplex advantage is achieved over single resolution element spectrometers (Fabry-Perots, gratings) of generally attainable efficiency. An FTS seems to perform better than expected under high background conditions. Author (ESA)

90 ASTROPHYSICS

Includes cosmology; and interstellar and interplanetary gases and dust.

N85-28900# Ceskoslovenska Akademie Ved, Ondrejov. Astronomical Inst.
THE ROLE OF THERMAL MOTIONS OF AIR PARTICLES FOR FIREBALLS
V. Padevet 1985 91 p refs
(Publ-59) Avail: NTIS HC A05/MF A01

For small meteoric bodies, terminating high up in the atmosphere (i.e., under free molecular conditions) it was possible to neglect the effect of thermal motion of air particles. As regards fireballs, bodies with masses in excess of about 0.1 kg, penetrating deep into the atmosphere, the ambient atmosphere has the properties of a continuous medium. Under these conditions, the thermal motions of atmospheric particles behind the shock wave become the decisive factor for momentum and energy transfer to the meteoroid. For fireballs these thermal motions practically replace the effect of direct impacts of particles of the undisturbed atmosphere, considered earlier under free molecular conditions. The form of the equations, describing the motion and ablation of a large body (fireball) will remain the same as for small bodies, but the coefficients occurring in the equations will have a different physical meaning. Author

N85-28901# Royal Aircraft Establishment, Farnborough (England).
ANALYTICAL GENERATION OF SATELLITE ORBITS AT THE RAE (ROYAL AIRCRAFT ESTABLISHMENT)
R. H. Gooding Oct. 1984 18 p Presented at the 25th COSPAR Meeting, 5 Jul. 1984, Graz, Austria
(AD-A152655; RAE-TM-SPACE-345; BR94603) Avail: NTIS HC A02/MF A01 CSCL 22/3

This Paper traces the development, at the Royal Aircraft Establishment, of computer programs for orbit determination and orbit evolution. The principal program, PROP, is still in regular use, having an accuracy of 50 to 100 m for the orbits of close satellites determined over a period of a few days even when the drag is severe. The chief limitation of PROP is the absence of lunisolar perturbations, but these are included in a companion program, PROD, for the evolution of mean elements. Work of recent years has focused on a framework for far more accurate representation and generation of orbits. The method is purely analytical (as in PROP) for short-period perturbations, applied compactly via the use of a special system of spherical coordinates, but employs a degree of numerical integration in the variation of mean elements. The goal is single program that would eventually supersede the the PROP-PROD combination, providing an accuracy of perhaps 1 m. Author (GRA)

N85-28902# Los Alamos Scientific Lab., N. Mex.
X-RAY EMISSION AND THE WINDS OF CATACLYSMIC VARIABLES
F. A. Cordova 1985 8 p refs Presented at the Japan/US Seminar on Compact Galactic and Extragalactic X-ray Sources, Tokyo, 15 Jan. 1985
(Contract W-7405-eng-36)
(DE85-007663; LA-UR-85-530; CONF-850160-1) Avail: NTIS HC A02/MF A01

X-ray and ultraviolet observations of cataclysmic variable stars

reveal a variety of exotic behavior like pulsations, winds, and episodic outbursts. It is questioned if the behaviors are related, what they tell about the nature of the outburst, and about the environment of the accreting white dwarf. The observed changes in the X-ray and UV continuum and spectral features through the outbursts of the dwarf novae are summarized. The modeling of these data and how they refined ideas about the location and nature of the emissions, and the source of the outbursts are discussed. It is shown how comparisons of the X-ray and UV properties of cataclysmic variables with similar phenomena in other astronomical systems - the solar corona, OB stars, and Be stars - suggest ways in which the X-ray and UV emissions in CVs may be related, and point to further, specific observations that would elucidate the understanding of the behavior and role of the white dwarf in the outburst. DOE

N85-28903# Astronomische Rechen-Institut, Heidelberg (West Germany).
STUDY OF THE ACCURACY OF ASTROMETRIC OBSERVATIONS OF COMETS Final Report
Siegfried F. Roeser Paris ESA 31 May 1984 82 p refs
(Contract ESOC-5759/83/D-IM(SC))
(ESA-CR(P)-1964) Avail: NTIS HC A05/MF A01

The accuracy of astrometric observations of comets in the past 200 yr is discussed, particularly Halley's comet at its 1759, 1835 and 1910 apparitions. The influence of the positions of reference stars, the accuracy of relative measurements between comets and stars with various techniques, and optimum equipment for observations of comets are considered. Author (ESA)

91 LUNAR AND PLANETARY EXPLORATION

Includes planetology; and manned and unmanned flights. For spacecraft design see *18 Spacecraft Design Testing, and Performance*. For space stations see *15 Launch Vehicles and Space Vehicles*.

N85-28904*# Atmospheric and Environmental Research, Inc., Cambridge, Mass.
COMETARY ATMOSPHERES: MODELING THE SPATIAL DISTRIBUTION OF OBSERVED NEUTRAL RADICALS Annual Report, 1 Jun. 1984 - 31 May 1985
Michael R. Combi Jun. 1985 29 p refs
(Contract NASw-3950)
(NASA-CR-175882; NAS 1.26:175882) Avail: NTIS HC A03/MF A01 CSCL 03B

Progress on modeling the spatial distributions of cometary radicals is described. The Monte Carlo particle-trajectory model was generalized to include the full time dependencies of initial comet expansion velocities, nucleus vaporization rates, photochemical lifetimes and photon emission rates which enter the problem through the comet's changing heliocentric distance and velocity. The effect of multiple collisions in the transition zone from collisional coupling to true free flow were also included. Currently available observations of the spatial distributions of the neutral radicals, as well as the latest available photochemical data were re-evaluated. Preliminary exploratory model results testing the effects of various processes on observable spatial distributions are also discussed. R.J.F.

N85-28905*# Smithsonian Astrophysical Observatory, Cambridge, Mass.
THE STUDY OF THE PHYSICS OF COMETARY NUCLEI Semiannual Progress Report, 1 Apr. 1984 - 31 Mar. 1985
Fred L. Whipple Jun. 1985 5 p
(Grant NsG-7082)
(NASA-CR-175917; NAS 1.26:175917; SAPR-20; SAPR-21) Avail: NTIS HC A02/MF A01 CSCL 03B

The development and utilization of an optimized computer program to analyze orbital stabilization by repeated calculations is presented. The stability of comets in the Opik-Oort Cloud about the Sun against perturbations by the Galactic center involve the same basic type of calculation. The supposed persistence of these bodies in orbits over the life of the solar system, depends upon the stability of bodies of negligible mass in orbits around a body whose mass is small compared to the central mass about which they revolve. The question remains of preferential orientation of extremely eccentric comet orbits, possibly to explain the asymmetry observed among new comet motions. A third application of the computing programs is suited to meteoroids that may exist in orbits about asteroids and that may endanger science spacecraft making flybys too near to asteroids. As in the double-comet case, solar activity and solar gravitational perturbations limit the attendance to an asteroid by small meteroids in their orbits. It is found that the mass distances planned for asteroid fly-bys are adequate. Author

N85-28906# Argonne National Lab., Ill.
ADSORPTION OF Hg ON LUNAR SAMPLES
G. W. Reed, Jr. and S. Jovanovic 1985 3 p refs Presented at the 16th Lunar and Planetary Sci. Conf., Houston, Tex., 11 Mar. 1985
(Contract W-31-109-eng-38)
(DE85-007948; CONF-8503115-1) Avail: NTIS HC A02/MF A01

The presence, migration mechanisms and trapping of indigneous gases and volatiles on the Moon were studied. The rare gases Ar and Xe and highly volatile Hg(0) and Br(0) were determined to be present in the lunar regolith. Evidence for these elements in the Moon was reviewed. The sorption behavior of Xe on lunar material was examined. Preliminary results of a study designed to rationalize the behavior of Hg in lunar material are reported. DOE

92 SOLAR PHYSICS

Includes solar activity, solar flares, solar radiation and sunspots.

N85-28907*# Colorado Univ., Boulder. Dept. of Astrophysical, Planetary and Atmospheric Sciences.
ELECTRON-CYCLOTRON MASER EMISSION DURING SOLAR AND STELLAR FLARES
R. M. Winglee [1985] 5 p refs
(Grants NAGw-91; NsG-7287)
(NASA-CR-175883; NAS 1.26:175883) Avail: NTIS HC A02/MF A01 CSCL 03B

Radio bursts, with high brightness temperature $>$ 10 to the 10th power K and high degree of polarization, and the heating of the solar and stellar coronae during flares have been attributed to emission from the semirelativistic maser instability. In plasmas where the electron-plasma frequency, p, omega sub p, and the electron-cyclotron frequency, Omega sub e, are such that omega sup 2 sub p/Omega sup 2 sub e $<<1$, x-mode growth dominates while z-mode growth dominates if omega sup 2 sub p/Omega sup 2 sub e is of order unity. The actual value of omega sup 2 sub p/Omega sup 2 sub e at which x-mode growth dominates is shown to be dependent on the plasma temperature with x-mode growth dominating at higher omega sub p/Omega sub e as the plasma temperature increases. Observations from a set of 20 impulsive flares indicate that the derived conditions for the dominance of x-mode growth are satisfied in about 75 percent of the flares. Author

N85-28908# Aerospace Corp., El Segundo, Calif. Space Sciences Lab.
THE SOLAR CORONAL X-RAY SPECTRUM 5.5-12 A
D. L. McKenzie, P. B. Landecker, U. Feldman, and G. A. Doschek 1 Mar. 1985 46 p
(Contract F04701-83-C-0084)
(AD-A152334; TR-0084A(5940-01)-1; SD-TR-85-07) Avail: NTIS HC A03/MF A01 CSCL 03/2

Solar X-ray spectra in the wavelength range 5.5-12 a have been measured by the SOLEX spectrometers aboard the USAF p78-1 satellite. The spectra were measured under a variety of flaring and nonflaring conditions. High sensitivity, attained by summing data from several successive spectral scans, enabled the detection of 85 lines, 22 of which remain unidentified, in this wavelength range. In addition, observations of many strong lines were possible with individual scans during the course of the flare evolution. This capability, coupled with the availability of nonflare spectra, facilitated the identification of several lines. The lines of Fe XXII-XXIV are especially important in this wavelength range. For many of these lines, theoretical and observed line strengths GRA

N85-28909# Max-Planck-Inst. fuer Aeronomie, Katlenburg-Lindau (West Germany).
SOLAR WIND OBSERVATIONS ASSOCIATED WITH A SLOW FORWARD SHOCK WAVE AT 0.31 AU
A. K. Richter, H. Rosenbauer, F. M. Neubauer (Cologne Univ.), and N. G. Ptitsyna (Loizmiran) Nov. 1984 20 p refs Sponsored by Bundesministerium fuer Forschung und Technologie
(MPAE-W-79-84-46) Avail: NTIS HC A02/MF A01

A slow-forward shock-type discontinuity observed by Helios-1 on day 147, 1980, at 0.31 AU, is analyzed employing high resolution plasma and magnetic field measurements. It is shown that this event is not an MHD discontinuity, as the total pressure balance is violated and as the entropy increases across this structure even after inclusion of the alpha-particles. The Hada-Kennel relations $Ti/Te < 1$ and $beta > 1$ are satisfied upstream of this event even after inclusion of the alpha-particles, indicating that steepening of MHD slow waves dominates Landau damping. The Rankine-Hugoniot relations are fulfilled to an absolute difference of < 0.00001 by employing any possible combination of an up with a downstream time-averaged data set. The MHD evolutionary conditions are satisfied for any solution to the jump conditions. The shock speed, the amplitudes and relative amplitudes associated with this event are absolutely comparable to those derived for fast-mode shock waves within 1 AU. It is shown that this event is an almost quasi-perpendicular slow-forward MHD shock wave. Author (ESA)

93 SPACE RADIATION

Includes cosmic radiation; and inner and outer Earth's radiation belts.

For biological effects of radiation see *52 Aerospace Medicine*. For theory see *73 Nuclear and High-Energy Physics*.

N85-28910*# Wisconsin Univ., Madison. Space Physics Group.
COSMIC X-RAY PHYSICS Semiannual Status Report
D. McCammon, D. P. Cox, W. L. Kraushaar, and W. T. Sanders Jun. 1985 12 p
(Grant NAG5-629)
(NASA-CR-175908; NAS 1.26:175908) Avail: NTIS HC A02/MF A01 CSCL 03B

A progress report of research activities carried out in the area of cosmic X-ray physics is presented. The Diffuse X-ray Spectrometer DXS which has been flown twice as a rocket payload is described. The observation times proved to be too small for meaningful X-ray data to be obtained. Data collection and reduction activities from the Ultra-Soft X-ray background (UXT) instrument are described. UXT consists of three mechanically-collimated X-ray gas proportional counters with window/filter combinations which allow measurements in three energy bands, Be (80-110 eV), B (90-187 eV), and O (e84-532 eV). The Be band measurements provide an important constraint on local absorption of X-rays from the hot component of the local interstellar medium. Work has also continued on the development of a calorimetric detector for high-resolution spectroscopy in the 0.1 keV - 8keV energy range. B.W.

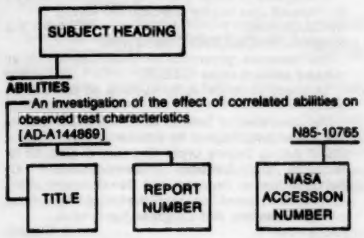
N85-28911# Air Force Technical Applications Center, Patrick AFB, Fla.
RESULTS FROM RADIATION MONITORING EQUIPMENT EXPERIMENT ON STS-8 Final Report, 15 Aug. - 1 Sep. 1983
R. G. Madonna, R. L. Amico, V. L. Brown, and V. R. Kidd 9 Jul. 1984 40 p
(AD-A153241; AFTAC-TR-84-4) Avail: NTIS HC A03/MF A01 CSCL 18/4

The results from the Radiation Equipment Monitoring (RME) experiment, flown onboard STS-8 are presented and discussed. The RME consists of the HRM-III gamma ray counter and PRM neutron/proton dosimeter. The gamma ray data agree wtih data from previous flights. Large increases in count rates are observed when the Orbiter is in the South Atlantic Anomaly. Neutron/proton dosage is consistent with NASA predictions for STS-8. GRA

99 GENERAL

No abstracts in this category.

Typical Subject Index Listing



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A

ABLATION
Examination of a method for predicting the properties of railgun plasmas [AR-004-322] N85-28799
ABSORPTION
Process for clarification of water [DE85-007864] N85-28023
ABSORPTION SPECTROSCOPY
High resolution spectroscopy of C13O16 in gas mixtures [AD-A152625] N85-27991
Spectroscopy of surface adsorbed molecules [DE85-009452] N85-28768
Recent advances in optical measurement methods in physics and chemistry [DE85-006895] N85-28792
ABSORPTIVITY
Comprehensive silicon solar cell computer modeling [NASA-CR-175959] N85-28461
ABSTRACTS
Bibliography of Lewis Research Center technical publications announced in 1984 [NASA-TM-87012] N85-28876
ACCELERATED LIFE TESTS
Natural and accelerated aging of plastics N85-28123
A test methodology for an automated and interactive software development environment [AD-A152857] N85-28618
ACCELERATION (PHYSICS)
Acceleration insensitive oscillator [AD-D011621] N85-28236
A counterpart of Faxen's formula in potential flow [REPT-84-09] N85-28279
Design of SC cut 10 MHZ H.Q. crystals with G. sensitivity better than 2.10(-10)/G N85-28319
Wake fields and wake field acceleration [DE85-006054] N85-28750
Multiple time-scale methods in particle simulations of plasmas [DE85-007519] N85-28808
ACCELEROMETERS
Principles of designing digital compensating accelerometers N85-28172
Uniaxial angular accelerometers N85-28173
ACCUMULATORS
Development of a second-generation linear Fresnel Photovoltaic and Thermal (PVT) concentrator array, including fabrication and installation of a 200 square meter collector field [DE85-008473] N85-28465
ACCURACY
Separating the variances of noise components in the Global Positioning System [AD-P004578] N85-28295
An empirical comparison of the accuracy of univariate and multivariate corrections for range restriction [AD-A153071] N85-28670
Study of the accuracy of astrometric observations of comets [ESA-CR(P)-1964] N85-28903
ACETYLENE
Crossed molecular beam studies of the reactions of oxygen and fluorine atoms [AD-A153302] N85-28008
ACHIEVEMENT
The impact of group processing on achievement in cooperative learning groups [AD-A153168] N85-28551
Oral discussion, group-to-individual transfer and achievement in cooperative learning groups [AD-A153209] N85-28552
ACID RAIN
Oxygen isotopic study of the oxidation of SO2 by H2O2 in the atmosphere [DE85-004017] N85-28468
ACIDS
Correlation of zeolite ZSM-5 acid strength with catalytic activity and selectivity [DE85-005415] N85-28013
ACOUSTIC EMISSION
Method of assessment of start of slow crack growth by acoustic emission technique [BLL-BISI-TRANS-21762-(9022.06)] N85-28722
ACOUSTIC MEASUREMENT
The Shock and Vibration Digest, volume 17, no. 1 [AD-A151051] N85-28397
Sound intensity measurement N85-28398
ACOUSTIC SCATTERING
Scattering of sounds by piezoceramic cylindrical shell near rigid surface N85-28168
ACOUSTIC VELOCITY
Apparatus for measuring velocity of sound in fluids N85-28175
ACOUSTICS
Acoustic oscillations of rods and plates N85-28170
ACRYLATES
New air-curing lacquer systems with high solids content [BMFT-FB-T-85-005] N85-28124
ACTIVE CONTROL
Active Control Systems: Review, Evaluation and Projections [AGARD-CP-384] N85-27883
Active Control Technology (ACT): Past, present and future N85-27884
The state-of-the-art and future of flight control systems N85-27885
A perspective on supersaugmented flight control advantages and problems N85-27886
Aspects of application of ACT systems for pilot workload alleviation N85-27887
X-29 digital flight control system design N85-27889
The evolution of ACS for helicopters: Conceptual simulation studies to preliminary design N85-27890
Some flight test results with redundant digital flight control systems N85-27892
ACT flight research experience N85-27894
Flight testing and development of the F/A-18A digital flight control system N85-27896
OLGA: An open loop gust alleviation system N85-27897
Demonstration of relaxed static stability on a commercial transport N85-27898
Active control technology experience with the Space Shuttle in the landing regime N85-27900
Active control landing gear for ground load alleviation N85-27902
Wing buffeting active control testing on a transport aircraft configuration in a large sonic windtunnel N85-27903
A modular dissimilar redundant computer designed for high integrity control N85-27904
How to handle failures in advanced flight control systems of future transport aircraft N85-27905
The evolution of active control technology systems for the 1990's helicopter N85-27911
ADA (PROGRAMMING LANGUAGE)
Automatic distribution of programs in MASCOT and Ada (trademark) environments: A feasibility study [AD-A152665] N85-28614
AFIT GKS: A GKS implementation in the Ada programming language [AD-A152954] N85-28620
ADAPTATION
The design of an adaptive predictive coder using a single-chip digital signal processor [AD-A152461] N85-28231
Predictors of transfer adjustment: A longitudinal study [AD-A152482] N85-28548
ADAPTERS
Structure of SYLDA double launch system for Ariane N85-28185
ADAPTIVE CONTROL
Automatic flight control modes for the AFTI/F-111 mission adaptive wing aircraft N85-27909
Adaptive nulling at HF using a compact array of active parasitic antennas [AD-A152582] N85-28203
ADDITIVES
Jet fuel instability mechanisms [NASA-CR-175856] N85-28127
Lubricant and additive effects on spur gear fatigue life [NASA-TM-87044] N85-28373
ADDRESSING
A secure high-speed transaction protocol [CWI-CS-R8417] N85-28605
ADIABATIC CONDITIONS
Investigations of the material factors in the adiabatic shearing of steels [AD-A153084] N85-28418
A numerical study of the mean trajectory approximation in a non-adiabatic process [AD-A152763] N85-28737
ADJUSTING
Predictors of transfer adjustment: A longitudinal study [AD-A152482] N85-28548
ADSORBENTS
A study of gas solid reactions using coated piezoelectric detectors [AD-A153047] N85-28001
ADSORPTION
Correlation of zeolite ZSM-5 acid strength with catalytic activity and selectivity [DE85-005415] N85-28013
Methanol adsorption on Pt(111) [DE85-006802] N85-28017
Theory of laser-stimulated surface process. 2: A generalized-master-equation approach to energy transfer between an IR laser, an aspecties and phonons [AD-A153083] N85-28344
Multiple scattering effects in low energy alkali ion scattering: Application to the analysis of adsorbate ordering and bonding geometry [DE85-007575] N85-28757
Spectroscopy of surface adsorbed molecules [DE85-009452] N85-28768
Adsorption of Hg on lunar samples [DE85-007948] N85-28906
AERIAL PHOTOGRAPHY
Airphoto interpretation of vegetation and landforms for soil mapping N85-28436

AERODYNAMIC CHARACTERISTICS
Some effects of sweep direction and strakes for wings with sharp leading edges
[CA-8421] N85-27826
A method to calculate the parameters of wings of arbitrary planform
[AD-A152689] N85-27831
Design of robust controllers for a multiple input-multiple output control system with uncertain parameters application to the lateral and longitudinal modes of the KC-135 transport aircraft
[AD-A153100] N85-27877
The aerodynamics of control N85-27901

AERODYNAMIC CONFIGURATIONS
Supersonic aerodynamic characteristics of canard, tailless, and aft-tail configurations for 2 wing planforms
[NASA-TP-2434] N85-27822
Static and dynamic pressure measurements on a NACA 0012 airfoil in the Ames High Reynolds Number Facility
[NASA-TP-2485] N85-27823
Methods for design aerodynamics of modern transport aircraft
[DFVLR-FB-85-05] N85-27838
Addition of flexible body option to the TOLA computer program, part 1
[NASA-CR-132732-1] N85-27855
The flight control system for the Experimental Aircraft Programme (EAP) demonstration aircraft N85-27908
Propulsion efficiency of vibrating bodies in subsonic gas stream N85-28159

AERODYNAMIC DRAG
Aerodynamic performance of a wing in ground effect using the PANAIR program
[AD-A153303] N85-27832
Ice shapes and the resulting drag increase for a NACA 0012 airfoil
[NASA-TM-83556] N85-27839
Urban vehicle research project
[DE85-005444] N85-28889

AERODYNAMIC HEATING
Unsteady heat transfer due to time-dependent free stream velocity N85-27947
The role of thermal motions of air particles for fireballs
[PUBL-59] N85-28900

AERODYNAMIC INTERFERENCE
Adaptive wall wind tunnels and wall interference correction methods
[DFVLR-IB-222-84-A-37] N85-27912

AERODYNAMIC LOADS
Overview of aerothermodynamic loads definition study N85-27942
Research on structures and materials — aircraft structures
[B8580080] N85-28432

AERODYNAMIC STABILITY
Static and dynamic pressure measurements on a NACA 0012 airfoil in the Ames High Reynolds Number Facility
[NASA-TP-2485] N85-27823
Proceedings of the 9th US Air Force and the Federal Republic of Germany Data Exchange Agreement Meeting, Viscous and Interacting Flow Field Effects
[AD-A153020] N85-28266

AERODYNAMIC STALLING
Wing tunnel investigation of dynamic stall of an NACA 0018 airfoil oscillating in pitch
[NAE-AN-27] N85-27830

AERODYNAMICS
Upwind-difference methods for aerodynamic problems governed by the Euler equations
[REPT-84-23] N85-27834
Test devices for aeronautical research and technology
[NASA-TM-77651] N85-27914

AEROELASTICITY
An assessment of the suitability of the BHGA structural test rig for aerodynamic testing of hang gliders
[CA-8505] N85-27853
Flight trials of a modified gulfstream commander carrying external stores
[AD-A153376] N85-27859
On the wind-induced vibrations of a mass-spring system
[REPT-84-04] N85-28428

AEROSOLS
Study of the formation of sulfuric acid aerosols
[DE85-008102] N85-28011

AEROSPACE ENGINEERING
Activities in aerospace N85-27821
Techical services at NLR
[B8561898] N85-28671

AEROSPACE INDUSTRY
Activities in aerospace N85-27821

AEROSPACE SAFETY
FAA (Federal aviation administration) assessment of satellite concepts and aviation spectrum requirements
[AD-A152338] N85-28199

AEROSPACE SYSTEMS
European Science Notes, Volume 39, Number 3
[AD-A152446] N85-28717
Air Force technical objective document FY 86
[AD-A152730] N85-28855

AEROSPACE TECHNOLOGY TRANSFER
European Science Notes, Volume 39, Number 3
[AD-A152446] N85-28717

AEROTHERMODYNAMICS
Future fundamental combustion research for aeropropulsion systems
[NASA-TM-87049] N85-27870
Structural Integrity and Durability of Reusable Space Propulsion Systems
[NASA-CP-2381] N85-27941
Overview of aerothermodynamic loads definition study N85-27942
Heating parameter estimation using coaxial thermocouple gages in wind tunnel test articles
[AD-A153039] N85-28328

AFTERGLOWS
Gas phase ion-molecule chemistry of carbon, nitrogen and oxygen compounds
[AD-A152876] N85-27996

AGE FACTOR
The dynamical behavior of the age-size-distribution of a cell population
[CWI-AM-R8414] N85-28538

AGING (BIOLOGY)
Sleep deprivation and performance: Older age performance and limited sleep period use
[AD-A153102] N85-28540

AGING (MATERIALS)
Natural and accelerated aging of plastics N85-28123
Qualitative and quantitative determination of aging by mechanical tests — plastics N85-28393

AGREEMENTS
The effects of controversy and concurrence seeking on effective decision making
[AD-A153370] N85-28555

AGRICULTURE
Meteorology and food production: The theme of the 16 meteorology day
[AD-A152372] N85-28518

AIR
Aluminum-air power cell research and development
[DE85-008117] N85-28456
Air Weather Service (AWS) climatic briefs: Europe
[AD-A152528] N85-28519

AIR FLOW
Aerodynamic performance of a wing in ground effect using the PANAIR program
[AD-A153303] N85-27832
On Long's solution to hydrostatic flow over mountains
[DFVLR-MITT-84-02] N85-28503

AIR LAW
Rotterdam Airport and the Common Market N85-27840

AIR POLLUTION
Testing of materials and coatings for jet engine components under simulated operational conditions
[B8580073] N85-27873
A study of gas solid reactions using coated piezoelectric detectors
[AD-A153047] N85-28001
Investigation of air pollution impact in Eastern Bavaria: Measurement results from August and September, 1984
[DFVLR-FB-85-03] N85-28471
DFVLR measuring system for the determination of the spatial distribution of environmental parameters of the atmosphere by means of mobile instrumented platforms
[DFVLR-FB-85-09] N85-28472
Quality assurance for RESOLVE (Research on Operations-Limiting Visual Extinction). A visibility study in the California desert
[AD-A152383] N85-28494

AIR SAMPLING
Theoretical basis for the determination of the concentration of radon decay products in air from the activity of a particulate air sample
[IRI-190-83-07] N85-28774

AIR TRAFFIC CONTROL
National airspace review, change 1
[AD-A152369] N85-27844
Developments in the area of air traffic control systems and the relation with meteorology
[NLR-MP-84029-U] N85-27848

AIR TRAFFIC CONTROLLERS (PERSONNEL)
Construction of a job-oriented test for the selection of air traffic controllers
[DFVLR-FB-84-51] N85-28558

AIR WATER INTERACTIONS
Time-dependence of CO2-induced climate change
[DE85-007568] N85-28525

AIRBORNE EQUIPMENT
DFVLR measuring system for the determination of the spatial distribution of environmental parameters of the atmosphere by means of mobile instrumented platforms
[DFVLR-FB-85-09] N85-28472
Convective storm downdraft outflows detected by NASA/MSFC's Airborne 10.6 micron pulsed Doppler Lidar System
[NASA-CR-3898] N85-28511

AIRBORNE RADAR APPROACH
Investigation of imaging and flight guidance concepts for rotorcraft zero visibility approach and landing
[NASA-CR-166571] N85-27843

AIRBORNE/SPACEBORNE COMPUTERS
The interactive generation of specifications for an onboard software series (GISELE) N85-27906
Certifying complex digital systems on civil aviation aircraft N85-27907
The Department of Defense statement on the Science and Technology Program by Colonel Donald I. Carter, USAF Acting Deputy Under Secretary of Defense for Research and Advanced Technology before the Subcommittee on Research and Development of the Committee on Armed Services of the United States House of Representatives, 99th Congress, first session
[AD-A152467] N85-28850

AIRCRAFT ACCIDENTS
Frangibility of obstacles at airports
[NLR-MP-84002-U] N85-28431

AIRCRAFT CONSTRUCTION MATERIALS
Aluminum-lithium alloys: The answer of the aluminum industry to the threat of advanced fiber-reinforced materials
[VTH-LR-406] N85-28102
Research on structures and materials — aircraft structures
[B8580080] N85-28432

AIRCRAFT CONTROL
Controller requirements for uncoupled aircraft motion, volume 1
[AD-A153173] N85-27878
In-flight investigation of the influence of pitch damping and pitch control effectiveness on landing approach flying qualities of statically unstable transport aircraft
[DFVLR-FB-84-12] N85-27880
Proposals for the determination of necessary elevator handling characteristics of sailplanes in high speed range
[DFVLR-FB-84-52] N85-27882
Active Control Technology (ACT): Past, present and future N85-27884
The state-of-the-art and future of flight control systems N85-27885
Aspects of application of ACT systems for pilot workload alleviation N85-27887
Some flight test results with redundant digital flight control systems N85-27892
An update of experience on the fly by wire Jaguar equipped with a full-time digital flight control system N85-27893
Demonstration of relaxed static stability on a commercial transport N85-27896
The aerodynamics of control N85-27901
The STOL and maneuver technology program integrated control system development N85-27910

AIRCRAFT DESIGN
Methods for design aerodynamics of modern transport aircraft
[DFVLR-FB-85-05] N85-27838
Test flight of IL-76TD long-range transport variant N85-27842
Techical services at NLR
[B8561898] N85-28671

AIRCRAFT ENGINES
Test devices for aeronautical research and technology
[NASA-TM-77651] N85-27914
An investigation into the soot production processes in a gas turbine engine
[AD-A152710] N85-27992

AIRCRAFT FUELS
Fuel freeze point investigations
[AD-A152901] N85-28129

AIRCRAFT GUIDANCE
Investigation of imaging and flight guidance concepts for rotorcraft zero visibility approach and landing
[NASA-CR-166571] N85-27843

AIRCRAFT LANDING
A system for take-off and landing measurements (STALINS)
[B8580072] N85-27849
Addition of flexible body option to the TOLA computer program, part 1
[NASA-CR-132732-1] N85-27855
Addition of flexible body option to the TOLA computer program. Part 2: User and programmer documentation
[NASA-CR-132732-2] N85-27856

In-flight investigation of the influence of pitch damping and pitch control effectiveness on landing approach flying qualities of statically unstable transport aircraft
[DFVLR-FB-84-12] N85-27880

AIRCRAFT MANEUVERS
Parameter identification results of tests in nonsteady symmetric flight with the Hawker Hunter Mk 7
[NLR-TR-83042-U] N85-27860
The STOL and maneuver technology program integrated control system development N85-27910

AIRCRAFT MODELS
Parameter identification results of tests in nonsteady symmetric flight with the Hawker Hunter Mk 7
[NLR-TR-83042-U] N85-27860

AIRCRAFT PERFORMANCE
Parameter identification results of tests in nonsteady symmetric flight with the Hawker Hunter Mk 7
[NLR-TR-83042-U] N85-27860
Demonstration of relaxed static stability on a commercial transport N85-27898
Realisation of relaxed static stability on a commercial transport N85-27899

AIRCRAFT SAFETY
Flying in spite of the weather
[NLR-MP-84021-U] N85-27847

AIRCRAFT STABILITY
A perspective on superaugmented flight control advantages and problems N85-27886
Demonstration of relaxed static stability on a commercial transport N85-27898
Realisation of relaxed static stability on a commercial transport N85-27899

AIRCRAFT STRUCTURES
New materials and techniques for aircraft structures
[B8580074] N85-27861
Heat resistant Carbon Fiber Reinforced Plastics (CFRP) hardening equipment
[MBB/LFA33/CFK/PUB/007] N85-27976
Proceedings of the 9th US Air Force and the Federal Republic of Germany Data Exchange Agreement Meeting, Viscous and Interacting Flow Field Effects
[AD-A153020] N85-28266
Research on structures and materials — aircraft structures
[B8580080] N85-28432

AIRFOIL PROFILES
Design of a basic profile for a low sweep airfoil. Part 2: Experimental investigation on the DFVLR-W1 airfoil profile in the Brunswick transonic wind tunnel
[DFVLR-FB-85-01-PT-2] N85-27833
Integral profile method for production of carbon fiber sheets
[MBB/LFA34/CFK/PUB/006] N85-27975

AIRFOILS
Static and dynamic pressure measurements on a NACA 0012 airfoil in the Ames High Reynolds Number Facility
[NASA-TP-2485] N85-27823
Users manual for coordinate generation code CRDSRA
[NASA-CR-172584] N85-27824
User's manual for airfoil flow field computer code SRAIR
[NASA-CR-172585] N85-27825
Numerical study of porous airfoils in transonic flow
[NASA-TM-86713] N85-27828
Wing tunnel investigation of dynamic stall of an NACA 0018 airfoil oscillating in pitch
[NAE-AN-27] N85-27830
Ice shapes and the resulting drag increase for a NACA 0012 airfoil
[NASA-TM-83556] N85-27839
Proposals for the determination of necessary elevator handling characteristics of sailplanes in high speed range
[DFVLR-FB-84-52] N85-27882
New facility to study unsteady wake effects on turbine airfoil heat transfer N85-27948
Constitutive cyclic deformation behavior in single-crystal and directionally solidified SSME high-pressure fuel turbopump airfoil materials N85-27965
A 5-year research plan, 1985-1990. Wind energy technology: Generating power from the wind
[DE85-008427] N85-28463

AIRFRAME MATERIALS
New materials and techniques for aircraft structures
[B8580074] N85-27861

AIRFRAMES
USAF damage tolerant design handbook: Guidelines for the analysis and design of damage tolerant aircraft structures, revision B
[AD-A153161] N85-27858

AIRLINE OPERATIONS
Rotterdam Airport and the Common Market N85-27840

AIRPORTS
Rotterdam Airport and the Common Market N85-27840
Airport and airway system cost allocation model. Volume 7: User's manual
[AD-A152877] N85-27917
Frangibility of obstacles at airports
[NLR-MP-84002-U] N85-28431

AIRSPACE
Airport and airway system cost allocation model. Volume 7: User's manual
[AD-A152877] N85-27917

ALASKA
Structural analysis of terrane accretions in the eastern Brooks Range and adjacent areas in central Alaska and Canada
[DE85-008279] N85-28501

ALCOHOLS
Urban vehicle research project
[DE85-005444] N85-28689

ALGEBRA
Algebra of communicating processes
[CWI-CS-R8421] N85-28214
Boundary to constructive solid geometry mapings: A focus on 2-D issues N85-28570
A complete inference system for regular processes with silent moves
[CWI-CS-R8420] N85-28638
A high-accuracy optical linear algebra processor for finite element applications
[NASA-CR-175894] N85-28658
Discrete mathematics for communications systems
[AD-A152814] N85-28664

ALGORITHMS
Incorporating control into the optimal structural design of large flexible space structures
[AD-A152858] N85-27937
Enhacements to the TTS-502 time transfer system N85-28296
The steering of GPS time N85-28301
Automatic detection of gust fronts
[FAA/PM-85-11] N85-28516
A comparison of three curve intersection algorithms N85-28592
Tracking algorithm performance analysis program (TRAPP)
[DE85-007304] N85-28601
The addition of advanced scene rendering techniques to a general purpose graphics package
[AD-A153323] N85-28625
Evidential reasoning in expert systems for image analysis
[AD-A153379] N85-28627
Ray tracing general sweep defined objects
[REPT-84-36] N85-28636
Efficient parallel solution of linear systems with hyperbolic rotations
[AD-A152355] N85-28661
Numerical methods for stiff ordinary and elliptic partial differential equations
[AD-A153247] N85-28675
Parallel Cholesky factorization on a multiprocessor
[DE85-008762] N85-28682
Montonicity preserving bicubic interpolation, revision 1
[DE85-007976] N85-28683
A greedy algorithm for the transhipment along a single road problem
[AD-A152343] N85-28709
Maximum flow in planar networks with exponentially distributed arc capacities
[AD-A153158] N85-28710
Kirchhoff modeling via wave equation datuming
[AD-A152399] N85-28727

ALKALIES
Bifunctional oxygen electrodes
[DE85-006871] N85-28248
Multiple scattering effects in low energy alkali ion scattering: Application to the analysis of adsorbate ordering and bonding geometry
[DE85-007575] N85-28757

ALKALINE EARTH METALS
Inoculation of non-metallic inclusions in steel 17GS
[BLL-BISI-TRANS-22431-(9022.06)] N85-28042

ALKALINE EARTH OXIDES
Electronically excited alkaline earth oxides: Chemical production and collisional energy transfer processes
[AD-A153172] N85-28833

ALKALINITY
Ohmic potential drop and gas bubble radius distribution in alkaline water electrolysis N85-28025

ALKYD RESINS
New air-curing lacquer systems with high solids content
[BMFT-FB-T-85-005] N85-28124

ALL-WEATHER AIR NAVIGATION
Flying in spite of the weather
[NLR-MP-84021-U] N85-27847

ALLOCATIONS
Airport and airway system cost allocation model. Volume 7: User's manual
[AD-A152877] N85-27917

ALLOYS
The influence of melting practice and of microalloying, with rare earth metals and with boron, on the quality of low-carbon steel
[BLL-BISI-22467-(9022.06)] N85-28036
Powder-metallurgy alloys and steels
[BLL-BISI-TRANS-22239-(9022.06)] N85-28050
New process for production of bimetal with corrosion-resistant cladding layer
[BLL-BISI-TRANS-22371-(9022.06)] N85-28056
Production and compaction of amorphous metal powders
[BLL-BISI-TRANS-22387-(9022.06)] N85-28080
In situ HVEM studies of electron beam-driven composition changes in thin film alloys: Displacement-rate gradient effects
[DE85-007992] N85-28092
Temperature and manganese content dependences of tensile deformation in iron-high manganese binary alloys
[DE85-007656] N85-28096
Submerged arc welding of new Czechoslovak micro-alloy steels
[BLL-BISI-TRANS-22193-(9022.06)] N85-28356

ALPINE METEOROLOGY
Statistical comparison of radar echoes of convective precipitation between the northern Alps and its foreland
[DFVLR-FB-85-07] N85-28215

ALUMINUM
Friction and wear behavior of aluminum and composite I-beam stiffened airplane skins
[NASA-TM-86418] N85-27852
Influence of manganese and heat treatment on structure and properties of Fe-0.1 percent-C-14 percent Cr-based steels
[BLL-BISI-TRANS-22299-(9022.06)] N85-28071
Preventing the formation of an anomalous structure in chemically sealed low carbon steel
[BLL-BISI-TRANS-22373-(9022.06)] N85-28085
Research on design of cryotransformers and its prospects for the future
[AD-A152400] N85-28230
Aluminum-air power cell research and development
[DE85-008117] N85-28456
Possible indication of an A-dependence of R in deep-inelastic electron scattering from nuclei
[DE85-009174] N85-28763

ALUMINUM ALLOYS
Aluminum-lithium alloys: The answer of the aluminum industry to the threat of advanced fiber-reinforced materials
[VTH-LR-406] N85-28102

ALUMINUM COATINGS
Technology development for thin-film-trace humidity sensors
[BMFT-FB-T-84-268] N85-28338

ALUMINUM OXIDES
Microstructure-mechanical property relationships in transformation-toughened ceramics
[DE85-009722] N85-28117

AMBIGUITY
Language design, computers and brains
[AD-A152819] N85-28594

AMMONIUM COMPOUNDS
Michelle-derived catalysts for extended Schulz-Flory
[DE85-005656] N85-28012

AMORPHOUS MATERIALS
Glassy metals: New highly resistant material
[BLL-BISI-TRANS-21764-(9022.06)] N85-28049
Obtaining amorphous coatings of FeW and Fe-Cr-P-B alloys using laser sputtering
[BLL-BISI-22493-(9022.06)] N85-28057
Production and compaction of amorphous metal powders
[BLL-BISI-TRANS-22387-(9022.06)] N85-28080
Thermal expansion effects in electrical transport in amorphous metals
[AD-A152477] N85-28089

ANALOG DATA
Pipelined programmable charge domain device
[AD-D011598] N85-28225

ANALYTICAL CHEMISTRY
The development of laser analytical methods for the characterization of solid-liquid and solid-high pressure gas interfaces
[AD-A152382] N85-27988

ANGLES (GEOMETRY)
Measurement and interpretation of electron angle at MABE beam stop
[DE85-008583] N85-28755

ANGULAR ACCELERATION
Uniaxial angular accelerometers N85-28173
ANGULAR DISTRIBUTION
Theoretical studies of heavy ion scattering processes [DE85-006823] N85-28753
ANGULAR MOMENTUM
Spin distributions in heavy ion fusion at and below the Coulomb barrier [DE85-007817] N85-28751
ANIONS
The electronic spectra of phthalocyanine radical anions and cations [AD-A152328] N85-27986
Gas phase ion-molecule chemistry of carbon, nitrogen and oxygen compounds [AD-A152676] N85-27996
ANNEALING
Thermomechanical softening treatment for bearing and tool steels [BLL-BISI-TRANS-22432-(9022.06)] N85-28035
Influence of preliminary cold deformation on fineness of pearlite [BLL-BISI-TRANS-22409-(9022.06)] N85-28054
The characteristic structure of weld metal of high temperature alloy X20CrMoV 121 [BLL-BISI-TRANS-21623-(9022.06)] N85-28069
Kinetics of the formation of a complex alloyed boride coating on iron and its properties [BLL-BISI-TRANS-22303-(9022.06)] N85-28084
Activities of the Solid State Physics Research Institute [NASA-CR-175899] N85-28818
ANNIHILATION REACTIONS
Experimental methods of heavy quark detection [DE85-006316] N85-28781
ANNUAL VARIATIONS
Precipitation and snow cover data, 1977 [ISBN-951-697-215-2] N85-28514
Observations of surface water temperature in the Netherlands since 1860: Statistics [KNMI-WR-84-3] N85-28531
Observations of surface water temperature in the Netherlands since 1860: Tables for light vessels [KNMI-WR-84-4] N85-28532
Observations of surface water temperature in the Netherlands since 1860: Series from KNMI-RWS [KNMI-WR-84-5] N85-28533
ANODES
Oxygen evolution on NiCo2O4 electrodes N85-28026
Bifunctional oxygen electrodes [DE85-006871] N85-28248
Streak tube characterization [DE85-009674] N85-28255
Molten carbonate fuel cell performance model update [DE85-003356] N85-28454
ANODIZING
Corrosion characteristics of some steels produced through a self-cleaning rotating electrode [BLL-BISI-TRANS-22046-(9022.06)] N85-28034
ANTENNA ARRAYS
Performance analysis of the DSN baseband assembly (Bba) Real-Time Combiner (RTC) [NASA-CR-175876] N85-28190
Performance analysis of the DSN baseband assembly (Bba) Real-Time Combiner (RTC) [NASA-CR-175877] N85-28193
Adaptive nulling at HF using a compact array of active parasitic antennas [AD-A152582] N85-28203
ANTENNA RADIATION PATTERNS
Performance analysis of the DSN baseband assembly (Bba) Real-Time Combiner (RTC) [NASA-CR-175877] N85-28193
ANTENNAS
Avionics data base [AD-A152415] N85-27863
Mathematical modeling and control of a large space structure as applied to a shuttle-antenna configuration [AD-A153269] N85-27939
APPROACH CONTROL
Construction of a job-oriented test for the selection of air traffic controllers [DFVLR-FB-84-51] N85-28558
APPROPRIATIONS
National Aeronautics and Space Administration Authorization Act, 1986 [S-REPT-99-91] N85-28885
APPROXIMATION
Characteristics of steady-state hypersonic flow about blunted bodies with discontinuities in generators N85-28155
SC filters and design centering of integrated circuits. Part 2: Design centering of integrated circuits [BMFT-FB-T-84-265-PT-2] N85-28257
Curved finite elements and curve approximation N85-28590
An inequality and its application to the truncated distributions N85-28673
Spatial differencing for finite difference codes [DE85-008902] N85-28684
On the accuracy of the Poincare-Lindstedt method [REPT-84-37] N85-28690
On the condition number of modified moment matrices arising from least squares approximation in the complex plane [AD-A152353] N85-28714
A numerical study of the mean trajectory approximation in a non-adiabatic process [AD-A152763] N85-28737
The mean trajectory approximation for charge and energy transfer processes at surfaces [AD-A152708] N85-28830
APTITUDE
Technical evaluation of the Naval Automated Pilot Aptitude Measurement System (NAPAMS) [AD-A152361] N85-28547
AQUEOUS SOLUTIONS
Kinetics of hydrolysis and products of hydrolysis and photolysis of tetryl [AD-A153144] N85-28005
Properties of nitrogen containing stainless alloy designed for high resistance to pitting [DE85-008282] N85-28095
ARC CHAMBERS
Study of a constricted electric arc cooled by transpiration [NASA-TM-77846] N85-28798
ARC DISCHARGES
The loss of material from the cathode of metal arcs [NASA-TM-77845] N85-27985
ARC WELDING
Submerged arc welding of new Czechoslovak micro-alloy steels [BLL-BISI-TRANS-22193-(9022.06)] N85-28356
Application of 4-wire submerged arc method to welding UOE pipe [BLL-BISI-TRANS-22417-(9022.06)] N85-28358
High-speed longitudinal welding of pipes by automatic submerged arc process [BLL-BISI-TRANS-22340-(9902.06)] N85-28366
ARCHITECTURE (COMPUTERS)
A modular dissimilar redundant computer designed for high integrity control N85-27904
VLSI workshop and project: February - November 1982 [WSRL-0374-TR] N85-28223
System Analysis for the Huntsville Operation Support Center, Distributed Computer System [NASA-CR-171506] N85-28642
Synchronization and fault-masking in redundant real-time systems [NASA-TM-87478] N85-28644
Interfacing the VAX 11/780 using Berkeley Unix 4.2.BSD and Ethernet based Xerox network systems, volume 1 [AD-A152953] N85-28645
Interfacing the VAX 11/780 using berkeley UNIX 4.2BSD and Ethernet based Xerox Network Systems [AD-A153174] N85-28647
A high-accuracy optical linear algebra processor for finite element applications [NASA-CR-175894] N85-28658
Efficient parallel solution of linear systems [AD-A152663] N85-28663
ARCTIC REGIONS
An assessment of atmospheric refractivity in the northern marginal ice zone [AD-A152346] N85-28493
ARGON
Welding of 11 458.1 steel in shielding atmospheres [BLL-BISI-TRANS-21763-(9022.06)] N85-28353
Hall mobility in fluid argon [DE85-007268] N85-28840
ARGON LASERS
Photochemical ignition studies. 1: Laser ignition of flowing premixed gases [AD-A153048] N85-28002
ARIANE LAUNCH VEHICLE
The Ariane launch vehicle is the key of the Europeans to the space market N85-27931
Structure of SYLDA double launch system for Ariane N85-28185
Documentation for the West German Federal Cabinet's space policy decision N85-28886
ARMED FORCES (FOREIGN)
Soviet weapons development and the scientific community [AD-P004562] N85-28857
The revolution in military affairs and the Soviet system [AD-P004568] N85-28863
ARMED FORCES (UNITED STATES)
Rome Development Center Air Force technical objective document C3I FY-86 [AD-A152476] N85-28851
Air Force technical objective document FY 86 [AD-A152730] N85-28855
ARRAYS
Analysis and modeling for thermal focal plane arrays [AD-A153156] N85-28329
ARTIFICIAL INTELLIGENCE
Application of artificial intelligence (AI) to radar image understanding [AD-A152519] N85-28654
A study of user-defined searching requirements for the on-line version of the directory of DOD-sponsored R and D data bases on the Defense Gateway computer system [AD-A153000] N85-28878
ARTIFICIAL SATELLITES
West Europe report: Science and technology [JPRS-WST-84-024] N85-28183
Structure of SYLDA double launch system for Ariane N85-28185
ASPECT RATIO
Aerodynamic performance of a wing in ground effect using the PANAIR program [AD-A153303] N85-27832
Solution to eigenvalue problems of antisymmetric cross-ply and antisymmetric angle-ply laminated plates using affine transformations [AD-A153040] N85-27980
ASPHALT
Anticorrosion protection of reinforcing steel in prestressed gypsum and anhydrite concrete [BLL-BISI-TRANS-22079-(9022.06)] N85-28044
ASSEMBLING
Robots, automatic devices inside VW's Wolfsburg plant N85-28186
ASSURANCE
Examination of steels by chemical analysis for quality assurance [BLL-BISI-TRANS-22068-(9022.06)] N85-28074
Principal quality assurance measures in the manufacture of HF-welded high-pressure linepipe [BLL-BISI-TRANS-21690-(9022.06)] N85-28389
ASTROLABES
Timing-system design considerations for a mobile astrolabe N85-28309
ASTROMETRY
Study of the accuracy of astrometric observations of comets [ESA-CR(P)-1964] N85-28903
ASTRONOMICAL TELESCOPES
Optical observations of HEAO-B objects N85-28895
ASTROPHYSICS
Activities report of the Institute for Extraterrestrial Physics [MPI-PAE/EXTRATERR-187] N85-28898
ASYMPTOTIC METHODS
On the accuracy of the Poincare-Lindstedt method [REPT-84-37] N85-28690
ASYMPTOTIC PROPERTIES
Asymptotic expansion of Jacobi polynomials [REPT-84-35] N85-28689
ASYMPTOTIC SERIES
Asymptotic expansion of Jacobi polynomials [REPT-84-35] N85-28689
A class of polynomials related to those of Laguerre [CWI-AM-R8411] N85-28693
Uniform asymptotic expansions of integrals [CWI-AM-R8412] N85-28694
ATMOSPHERIC ATTENUATION
Radar study of the melting layer [ESA-CR(P)-1974] N85-28527
ATMOSPHERIC BOUNDARY LAYER
Three powered sailplanes as meteorological instrumentation for atmospheric boundary layer studies at DFVLR [DFVLR-FB-84-50] N85-27862
ATMOSPHERIC CHEMISTRY
Oxygen isotopic study of the oxidation of SO2 by H2O2 in the atmosphere [DE85-004017] N85-28468
Homogeneous processes of atmospheric interest [NASA-CR-175770] N85-28475
Absolute calibrations of SO2 and NO analyzers by photographic methods [DFVLR-MITT-85-02] N85-28504
ATMOSPHERIC CIRCULATION
Potential climatic impacts of increasing atmospheric CO2 with emphasis on water availability and hydrology in the United States [NASA-TM-87479] N85-28517
Mathematical modeling and simulation of climate and climatic change [DE85-006974] N85-28526

ATMOSPHERIC COMPOSITION
Absolute calibrations of SO2 and NO analyzers by photographic methods
[DFVLR-MITT-85-02] N85-28504
Theoretical basis for the determination of the concentration of radon decay products in air from the activity of a particulate air sample
[IRI-190-83-07] N85-28774
ATMOSPHERIC MODELS
Homogeneous processes of atmospheric interest
[NASA-CR-175770] N85-28475
Geophysical plasmas and atmospheric modeling
[AD-A152805] N85-28497
Time-dependence of CO2-induced climate change
[DE85-007568] N85-28525
ATMOSPHERIC REFRACTION
An assessment of atmospheric refractivity in the northern marginal ice zone
[AD-A152346] N85-28493
ATMOSPHERIC SCATTERING
Earth observation modeling based on layer scattering matrices
[NLR-MP-84015-U] N85-28440
ATMOSPHERIC TEMPERATURE
Proper quality of anticorrosion work no matter how bad the atmospheric conditions
[BLL-BISI-TRANS-22080-(9022.06)] N85-28383
ATOMIC BEAMS
An examination of the use of wave packets for the calculation of atom diffraction by surface
[AD-A152760] N85-28735
ATOMIC CLOCKS
Recent improvements in the atomic time scales of the National Bureau of Standards N85-28290
Timing-system design considerations for a mobile astrolabe N85-28309
Methods for optimal recursive estimation of non-stationary time series, applications to atomic time and frequency metrology N85-28312
Kalman filtering with a two-state clock model N85-28314
Kalman filter estimates of the NAVSTAR satellite clock parameters N85-28315
Physics element design aspects for a tactical rubidium frequency standard N85-28321
ATOMIC COLLISIONS
Electronically excited alkaline earth oxides: Chemical production and collisional energy transfer processes
[AD-A153172] N85-28833
ATOMIC STRUCTURE
Clusters of transition metal atoms
[AD-A153126] N85-28740
ATOMS
The temperature dependence of diffracted beam intensities in atom-surface scattering
[AD-A152762] N85-28736
Clusters of transition metal atoms
[AD-A153126] N85-28740
The effect of ion-bombardment-induced atomic mixing on depth-profiling of interfaces
[AD-A153199] N85-28834
ATTITUDE CONTROL
Controller requirements for uncoupled aircraft motion, volume 2
[AD-A153300] N85-27879
Operating characteristics of a 0.87 kW-hr
[NASA-TM-87038] N85-28371
AURORAL IONIZATION
Geophysical plasmas and atmospheric modeling
[AD-A152805] N85-28497
AURORAS
IMS (International Magnetospheric Study) contributions to the understanding of auroral precipitation, transport, and particle sources
[AD-A152320] N85-28492
EISCAT electron density studies
[AD-A152820] N85-28498
Electron and ion distributions at high latitudes as measured by the Air Force polar orbiting satellites
[AD-A153242] N85-28500
AUSTENITE
Influence of preliminary cold deformation on fineness of pearlite
[BLL-BISI-TRANS-22409-(9022.06)] N85-28054
Textural transformations taking place during heat and mechanical treatment in triplex steels
[BLL-BISI-TRANS-22404-(9022.06)] N85-28063
Influence of structural state and alloy content of austenite on formation of martensitic phases in steels
[BLL-BISI-TRANS-22385-(9022.06)] N85-28068
Mechanical stabilization of austenite against epsilon martensite and its effect on deformation behavior in high manganese steels
[DE85-007654] N85-28097
AUSTENITIC STAINLESS STEELS
Stainless steels: Application and welding
[BLL-BISI-TRANS-22357-(9022.06)] N85-28059
Technical information: Weldability of stainless steel. Part 1: Austenitic stainless steel
[BLL-BISI-TRANS-22456-(9022.06)] N85-28362
Relaxation properties and fatigue fracture resistance of austenitic spring steel
[BLL-BISI-TRANS-22300-(9022.06)] N85-28406
AUSTRALIA
Australian seismological report, 1980
[REPT-252] N85-28473
AUTOIONIZATION
Experimental approaches to the measurement of dielectronic recombination
[DE85-006627] N85-28743
AUTOMATIC CONTROL
Automation and robotics for the National Space Program
[NASA-CR-175881] N85-27936
Robots, automatic devices inside VW's Wolfsburg plant N85-28186
Future directions of robotics, automation in Italy N85-28187
Applications of robots in machine tool industry reviewed N85-28189
A programming system for a modular flexible multimicrocomputer system for the automatic control of automated test equipment
[JUEL-1962] N85-28641
AUTOMATIC FLIGHT CONTROL
Automatic flight control modes for the AFTI/F-111 mission adaptive wing aircraft N85-27909
AUTOMATIC TEST EQUIPMENT
A programming system for a modular flexible multimicrocomputer system for the automatic control of automated test equipment
[JUEL-1962] N85-28641
AUTOMATION
Efforts at office automation and information systems utilization at Martin Marietta Energy Systems, Incorporated
[DE85-006154] N85-28633
DLA: Data/data base administration analysis
[AD-A153031] N85-28679
AUTOMOBILE ENGINES
Determination of wear intensity and resource of crankshafts and cylinder liners of ZIL-130 and ZMZ-53 engines
[BLL-BISI-TRANS-21393-(9022.06)] N85-28355
Exhaust systems for passenger vehicles: Test procedure for resistance to internal corrosion of silencers
[BLL-BISI-TRANS-22360-(9022.06)] N85-28361
AUTOMOBILES
Robots, automatic devices inside VW's Wolfsburg plant N85-28186
Exhaust systems for passenger vehicles: Test procedure for resistance to internal corrosion of silencers
[BLL-BISI-TRANS-22360-(9022.06)] N85-28361
Report to Congress on the Automotive Technology Development Program
[DE85-005640] N85-28890
AUTONOMOUS SPACECRAFT CLOCKS
First results of GPS time transfer to Australia N85-28294
Separating the variances of noise components in the Global Positioning System
[AD-P004578] N85-28295
On-orbit frequency stability analysis of the GPS NAVSTAR's 3 and 4 rubidium clocks and NAVSTAR's 5 and 6 cesium clocks N85-28298
AVIONICS
Avionics data base
[AD-A152415] N85-27883
The Avionics Flight Evaluation System (AFES) of DFVLR
[DFVLR-MITT-85-01] N85-27884
Air Force technical objective document FY 86
[AD-A152730] N85-28855
AXIAL LOADS
Calculation of friction at spherical bearing journals in turbomachines N85-28150
AXIAL STRAIN
Uniaxial angular accelerometers N85-28173
AXIAL STRESS
Biaxial buckling of specially orthotropic, symmetric composite rectangular plates
[AD-A152958] N85-28417
Uniaxial stress induced symmetry breaking for muon sites in Fe N85-28820
AXISYMMETRIC FLOW
Characteristics of steady-state hypersonic flow about blunted bodies with discontinuities in generators N85-28155
Impact starting of plane nozzles with wide divergence angle N85-28156
Navier-Stokes computational study of axisymmetric transonic turbulent flows with a two-equation model of turbulence
[AD-A152653] N85-28265
AZINES
The electrochemistry of azine, oxazine and thiazine dyes
[AD-A152394] N85-27990

B

BACKGROUND NOISE
Background noise measurements from jet exit vanes designed to reduced flow pulsations in an open-jet wind tunnel
[NASA-TM-86383] N85-27916
BACKSCATTERING
An experimental investigation of the angular scattering and backscattering behaviors of the simulated clouds of the outer planets
[NASA-CR-175909] N85-28896
BACTERIA
Fatty and aromatic acid catabolizing bacteria from methanogenic ecosystems
[DE85-008133] N85-28537
BALANCING
Stressed-strained state of tightening buckles in sectional runners of gas turbines N85-28149
BALL BEARINGS
Physio-chemical mechanisms of the processes of the formation of globular inclusions in ball-bearing metal
[BLL-BISI-TRANS-22235-(9022.06)] N85-28030
Operating characteristics of a 0.87 kW-hr
[NASA-TM-87038] N85-28371
BALLOON-BORNE INSTRUMENTS
Balloon-borne, He-cooled Fourier transform spectrometer for far infrared astronomy
[MPE-IR-41] N85-28899
BANACH SPACE
On stochastic integral representation of stable processes with sample paths in Banach spaces
[AD-A152927] N85-28703
BAND STRUCTURE OF SOLIDS
Preventing the formation of an anomalous structure in chemically sealed low carbon steel
[BLL-BISI-TRANS-22373-(9022.06)] N85-28085
BARENTS SEA
Modern sedimentation in the northern Barents Sea: Input, dispersal and deposition of suspended sediments from glacial meltwater
[AD-A152520] N85-28530
BARYON RESONANCE
Proposal for the systematic naming of mesons and baryons
[DE85-008453] N85-28773
BARYONS
Proposal for the systematic naming of mesons and baryons
[DE85-008453] N85-28773
BATHYMETERS
An assessment of the potential role of multispectral imagery in bathymetric charting
[AD-A152460] N85-28438
BATTERY CHARGERS
Test and evaluation of the Hoppecke Model E240G144/16 electric vehicle battery charger
[DE85-900573] N85-28253
BAYES THEOREM
Optimal design and use of retry in fault tolerant real-time computer systems
[NASA-CR-175920] N85-28643
BEAM INJECTION
Experiments with light ions at CERN super proton synchrotron
[DE85-007625] N85-28744
Alternating gradient synchrotron
[DE85-005950] N85-28759
BEAM INTERACTIONS
Experiments and detectors for high energy heavy ion colliders
[DE85-007927] N85-28748
Report of the Working Group on Other Acceleration Schemes
[DE85-008447] N85-28764
BEAM WAVEGUIDES
Heavy ion fusion accelerator research in the US
[DE85-008465] N85-28767
BEAMS (RADIATION)
High precision materials characterization in the near millimeter wave-length range
[AD-A153267] N85-28331

The temperature dependence of diffracted beam intensities in atom-surface scattering
[AD-A152762] N85-28736
Heavy ion fusion accelerator research in the US
[DE85-008465] N85-28767
Large, energetic cluster impacts on surfaces
[DE85-006550] N85-28769

BEAMS (SUPPORTS)
Deployable controllable geometry truss beam
[NASA-TM-86366] N85-27934
Numerical solution of one-dimensional nonlinear problems of statics for elastic beams and shells under rigid constraints N85-28166

BEDROCK
Saudi Arabian refraction profile: Crustal structure of the Red Sea-Arabian Shield transition N85-28484
Saudi Arabian refraction profile: A preliminary interpretation for the Red Sea-Arabian Shield transition N85-28485
A traveltime interpretation of the 1978 seismic refraction profile in the Kingdom of Saudi Arabia N85-28486
Interpretation of the data of USGS seismic refraction profile across the Arabian Shield in western Saudi Arabia N85-28488
One-dimensional velocity-depth functions determined for the Arabian Shield and the southwestern Red Sea: A comparison of models N85-28490
A comparison of crustal sections: Arabian Shield to the Red Sea N85-28491

BERYLLIUM
Radiation damage experiments and lifetime estimates for beryllium components in fusion systems
[DE85-008038] N85-28811

BIBLIOGRAPHIES
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[NASA-CR-175873] N85-28448
COSMIC Software Catalog, 1985 edition
[NASA-CR-174070] N85-28608

BIMETALS
New process for production of bimetal with corrosion-resistant cladding layer
[BLL-BISI-TRANS-22371-(9022.06)] N85-28056
Effects of the structural state in thermo-bimetals on their resistance to microscopic plastic deformation
[BLL-BISI-TRANS-22403-(9022.06)] N85-28412

BINARY ALLOYS
Glassy metals: New highly resistant material
[BLL-BISI-TRANS-21764-(9022.06)] N85-28049
The structure of carbon martensite analyzed with Moessbauer spectra
[BLL-BISI-TRANS-22402-(9022.06)] N85-28062
Use of principle of local equilibrium for assessing diffusional supersaturation during solidification of alloys
[BLL-BISI-TRANS-22487-(9022.06)] N85-28077

BINARY DIGITS
Development of new circuit symbols for binary logic elements
[MBB-Z-39/85-O] N85-28640

BINARY MIXTURES
Experimental and theoretical study of condensation in multicomponent vapors
[DE85-009357] N85-28021

BIOASTRONAUTICS
The cosmic history of the biogenic elements and compounds
[NASA-SP-476] N85-28562

BIOCHEMISTRY
Academician Ovchinnikov on future of bioorganic chemistry N85-28874

BIODYNAMICS
Stabilizing force feedback in bio-actuated control systems
[AD-D011634] N85-28560

BIOFEEDBACK
Biofeedback and performance: An update
[AD-A153228] N85-28553
Stabilizing force feedback in bio-actuated control systems
[AD-D011634] N85-28560

BIOLOGICAL EFFECTS
Photosynthetic acclimation of Acer saccharum
[DE85-006247] N85-28536
Biological and human health effects of extremely low frequency electromagnetic fields. Post-1977 literature review
[AD-A152731] N85-28539
The cosmic history of the biogenic elements and compounds
[NASA-SP-476] N85-28562

BIOLOGICAL MODELS (MATHEMATICS)
The dynamical behavior of the age-size-distribution of a cell population
[CWI-AM-R8414] N85-28538

BIOMASS ENERGY PRODUCTION
Alcohol Fuels Program technical review, spring 1984
[DE85-002919] N85-28134

BIONICS
Distributed memory
[AD-A153364] N85-28554
Numerical estimation of the curvature of biological surfaces N85-28588
Verbal information processing paradigms: A review of theory and methods
[AD-A153229] N85-28880

BIOTECHNOLOGY
Progress, goals in biotechnology summarized N85-28182

BIREFRINGENCE
Incident beam polarization for laser Doppler velocimetry employing a sapphire cylindrical window
[NASA-TM-87064] N85-28786

BIT SYNCHRONIZATION
Distributed elections in a ring of processors using Archimedean time
[CWI-CS-R8416] N85-28653

BLANKETS (FUSION REACTORS)
Radiation damage experiments and lifetime estimates for beryllium components in fusion systems
[DE85-008038] N85-28811
Two-dimensional TBR calculations for conceptual compact reversed-field pinch reactor blanket
[DE85-007636] N85-28812

BLOCKS
Lattice actions improved by block-spin renormalisation group and maximally symmetric lattices
[DE85-007416] N85-28841

BLOWDOWN WIND TUNNELS
Transonic Mach number determination in a blow-down wind tunnel with solid walls and a downstream throat
[VTH-LR-402] N85-27835

BLUFF BODIES
An experimental investigation of a turbulent junction vortex
[NASA-CR-175915] N85-28259

BODIES OF REVOLUTION
Method of solving problems of statics for multilayer shells of revolution N85-28167
Proceedings of the 9th US Air Force and the Federal Republic of Germany Data Exchange Agreement Meeting, Viscous and Interacting Flow Field Effects
[AD-A153020] N85-28266

BODY-WING AND TAIL CONFIGURATIONS
Supersonic aerodynamic characteristics of canard, tailless, and aft-tail configurations for 2 wing planforms
[NASA-TP-2434] N85-27822

BOILERS
Erosion of corrosion-resistant surface treatments on alloy steels
[DE85-008446] N85-28100

BOILING WATER REACTORS
Inspection evaluation and repair of the flawed feedwater nozzle of the 50 MWe Dodewaard GKN boiling water reactor
[ISBN-90-353-0017-3] N85-28394

BOLTZMANN TRANSPORT EQUATION
The transport of neutral H, D, T and He and O in the boundary layers of a Tokamak plasma
[REPT-84-153] N85-28817

BONDING
Multiple scattering effects in low energy alkali ion scattering: Application to the analysis of adsorbate ordering and bonding geometry
[DE85-007575] N85-28757

BOOLEAN FUNCTIONS
Efficient VLSI (Very Large Scale Integration) fault simulation
[AD-A152661] N85-28233

BORIDES
Pressed boride cathodes
[NASA-TM-77821] N85-27984

BORON
The influence of melting practice and of microalloying, with rare earth metals and with boron, on the quality of low-carbon steel
[BLL-BISI-22467-(9022.06)] N85-28036

BORON ALLOYS
Kinetics of the formation of a complex alloyed boride coating on iron and its properties
[BLL-BISI-TRANS-22303-(9022.06)] N85-28084
Examples of application of machinability tests
[BLL-BISI-TRANS-22346-(9022.06)] N85-28363

BOROSILICATE GLASS
Physical-chemical model for the mechanism of glass corrosion with particular consideration of simulated radioactive waste glasses
[DE85-007713] N85-28121

BOTANY
Botany facility phase A study. Core payload number 6 EURECA carrier, volume 1
[ESA-CR(P)-1978-VOL-1] N85-27918
Botany facility phase A study. Core payload number 6 for EURECA carrier, volume 2
[BF-TD-DRD-03-VOL-2] N85-27919

BOUNDARIES
Boundary to constructive solid geometry mapings: A focus on 2-D issues N85-28570

BOUNDARY LAYER CONTROL
Numerical study of porous airfoils in transonic flow
[NASA-TM-86713] N85-27828

BOUNDARY LAYER EQUATIONS
Boundary layer and parabolic flows
[DFVLR-FB-84-46] N85-28285

BOUNDARY LAYER FLOW
A Navier-Stokes capillary free boundary in open boat crystal growth
[REPT-84-34] N85-28283
Tidal rectification in lateral viscous boundary layers of a semienclosed basin
[CWI-AM-R8415] N85-28284
Boundary layer and parabolic flows
[DFVLR-FB-84-46] N85-28285
The transport of neutral H, D, T and He and O in the boundary layers of a Tokamak plasma
[REPT-84-153] N85-28817

BOUNDARY LAYER SEPARATION
An experimental investigation of a turbulent junction vortex
[NASA-CR-175915] N85-28259
Proceedings of the 9th US Air Force and the Federal Republic of Germany Data Exchange Agreement Meeting, Viscous and Interacting Flow Field Effects
[AD-A153020] N85-28266

BOUNDARY LAYER TRANSITION
On the effect of wing taper and sweep direction on leading edge transition
[CA-8435] N85-27827

BOUNDARY LAYERS
On the effect of wing taper and sweep direction on leading edge transition
[CA-8435] N85-27827
Free-surface phenomena under low- and zero-gravity conditions
[NASA-CR-175885] N85-27922
The boundary layers as the primary transport regions of the Earth's magnetotail
[AD-A152714] N85-28496

BOUNDARY VALUE PROBLEMS
On the accuracy of the Poincare-Lindstedt method
[REPT-84-37] N85-28690
On the algebraic equations in implicit Runge-Kutta methods
[CWI-NM-R8413] N85-28696
Analysis of nonlinear parabolic equations modeling plasma diffusion across a magnetic field
[DE85-007683] N85-28807

BRAIN
Distributed memory
[AD-A153364] N85-28554
Language design, computers and brains
[AD-A152819] N85-28594

BRANCHING (MATHEMATICS)
Flow through finite collapsible tubes: A branching problem
[REPT-84-29] N85-28281
Analytical shear buckling investigation of curved composite panels
[AD-A153138] N85-28421
Chaos and order in an optical ring cavity
[CWI-AM-R8416] N85-28795
Nonlinear problems in continuum mechanics
[AD-A153387] N85-28846

BRASSES
X-ray diffraction study of changes in stress-strain distributions during fatigue of a 2-phase alloy
[AD-A152367] N85-28087

BRAZING
Indirect brazing of structural ceramics for uncooled diesels
[DE85-005569] N85-28116

BREADBOARD MODELS
Development of a microprocessor controlled communication system for ships
[BMFT-FB-T-84-275] N85-28216

BREEDER REACTORS
Radiation damage experiments and lifetime estimates for beryllium components in fusion systems
[DE85-008038] N85-28811
Two-dimensional TBR calculations for conceptual compact reversed-field pinch reactor blanket
[DE85-007636] N85-28812

BRIGHTNESS TEMPERATURE
Electron-cyclotron maser emission during solar and stellar flares
[NASA-CR-175883] N85-28907
BRITTLENESS
Frangibility of obstacles at airports
[NLR-MP-84002-U] N85-28431
BROADBAND
Wideband integrated voice/data technology
[AD-A152329] N85-28197
BROKEN SYMMETRY
Activities of the Solid State Physics Research Institute
[NASA-CR-175899] N85-28818
Uniaxial stress induced symmetry breaking for muon sites in Fe N85-28820
BROMINE
A micrographic and gravimetric study of intercalation and deintercalation of graphite fibers
[NASA-TM-87026] N85-28110
BROMINE COMPOUNDS
Crossed molecular beam studies of the reactions of oxygen and fluorine atoms
[AD-A153302] N85-28008
BUBBLES
Fluid surface behavior in low gravity. Center discretionary fund no. 83-21
[NASA-TP-2486] N85-28260
BUCKLING
Solution to eigenvalue problems of antisymmetric cross-ply and antisymmetric angle-ply laminated plates using affine transformations
[AD-A153040] N85-27980
Continuum modeling of latticed structures N85-28399
The Shock and Vibration Digest, volume 17, no. 2
[AD-A153129] N85-28400
Recent progress in the dynamic plastic behaviour of structures, part 4 N85-28402
Buckling and bracing of cantilevers
[CE-42] N85-28413
Biaxial buckling of specially orthotropic, symmetric composite rectangular plates
[AD-A152958] N85-28417
Analytical shear buckling investigation of curved composite panels
[AD-A153138] N85-28421
BUFFER STORAGE
Techniques for operating Charge Coupled Devices (CCD's) in very high speed framing mode
[AD-A152878] N85-28238
BUFFERS (CHEMISTRY)
Kinetics of hydrolysis and products of hydrolysis and photolysis of tetryl
[AD-A153144] N85-28005
BUFFETING
Wing buffeting active control testing on a transport aircraft configuration in a large sonic windtunnel N85-27903
BUMPY TORUSES
Theoretical and numerical studies of magnetic field line displacements in an Elmo Bumpy Torus
[DE85-008757] N85-28816
BUSHINGS
Telescoping low vibration pulling mechanism for Czochralski crystal growth
[AD-D011655] N85-28836
BUTANES
Detailed chemical kinetic study of the effect of molecular structure on autoignition of fuel-air mixtures
[DE85-004424] N85-28010
BUTT JOINTS
Differential between crack and pseudo-crack indications by means of objective magnetic flux leakage testing
[BLL-BISI-TRANS-22033-(9022.06)] N85-28386

C

C-135 AIRCRAFT
Design of robust controllers for a multiple input-multiple output control system with uncertain parameters application to the lateral and longitudinal modes of the KC-135 transport aircraft
[AD-A153100] N85-27877
CALCIUM
The effect of microalloying with calcium and magnesium on the plasticity of Poldi AKN 20 Ni-based alloy
[BLL-BISI-TRANS-2174-(9022.06)] N85-28075
Examples of application of machinability tests
[BLL-BISI-TRANS-22346-(9022.06)] N85-28363
Cluster production and entropy
[DE85-007626] N85-28752
CALIBRATING
Transonic Mach number determination in a blow-down wind tunnel with solid walls and a downstream throat
[VTH-LR-402] N85-27835
Simulation of gyrocompassing alignment and calibration of strapdown inertial navigation system in a swaying vehicle
[DFVLR-MITT-84-20] N85-27850
Construction 1976-1980: Design, manufacturing, calibration of the German-Dutch wind tunnel (DNW) N85-27913
Heat flux sensor calibrator N85-27970
Proceedings of the Fifteenth Annual Precise Time and Time Interval (PTTI) Applications and Planning Meeting
[AD-A149163] N85-28287
New time and frequency services at the National Bureau of Standards N85-28289
Separating the variances of noise components in the Global Positioning System
[AD-P004578] N85-28295
Unattended TV time transfer results N85-28305
Field theory analysis using the finite element method to determine the deliberation curves of three dimensional fracture mechanics specimens with a semicircular surface crack applying the electrical direct current potential method for crack depth measurement
[GKSS-84/E/53] N85-28434
Comparison of measurement and simulation results of radiation temperatures applied to the thermal mapping of Munich
[DFVLR-FB-85-06] N85-28442
Absolute calibrations of SO2 and NO analyzers by photographic methods
[DFVLR-MITT-85-02] N85-28504
CALIFORNIA
Quality assurance for RESOLVE (Research on Operations-Limiting Visual Extinction). A visibility study in the California desert
[AD-A152383] N85-28494
CANADA
Structural analysis of terrane accretions in the eastern Brooks Range and adjacent areas in central Alaska and Canada
[DE85-008279] N85-28501
CANARD CONFIGURATIONS
Supersonic aerodynamic characteristics of canard, tailless, and aft-tail configurations for 2 wing planforms
[NASA-TP-2434] N85-27822
CANOPIES (VEGETATION)
Earth observation modeling based on layer scattering matrices
[NLR-MP-84015-U] N85-28440
Light scattering by leaf layers with application to canopy reflectance modeling: The Scattering by Arbitrarily Inclined Leaves (SAIL) model
[NLR-MP-84011-U] N85-28796
CANTILEVER BEAMS
Mathematical modeling and control of a large space structure as applied to a shuttle-antenna configuration
[AD-A153269] N85-27939
Buckling and bracing of cantilevers
[CE-42] N85-28413
CAPTURE EFFECT
Computer program for prediction of capture maneuver probability for an on-off reaction controlled upper stage
[NASA-CR-165937] N85-28611
CARBON
Multi-phase crystallization of ferrous alloys
[BLL-BISI-TRANS-22441-(9022.06)] N85-28037
The structure of carbon martensite analyzed with Moessbauer spectra
[BLL-BISI-TRANS-22402-(9022.06)] N85-28062
Influence of manganese and heat treatment on structure and properties of Fe-0.1 percent-C-14 percent Cr-based steels
[BLL-BISI-TRANS-22299-(9022.06)] N85-28071
Bifunctional oxygen electrodes
[DE85-006871] N85-28248
Thermodynamic calculations of equilibrium states in metal-carbon-hydrogen-oxygen system
[BLL-BISI-TRANS-22092-(9022.06)] N85-28844
CARBON COMPOUNDS
Gas phase ion-molecule chemistry of carbon, nitrogen and oxygen compounds
[AD-A152876] N85-27996
CARBON DIOXIDE
Welding of 11 458.1 steel in shielding atmospheres
[BLL-BISI-TRANS-21763-(9022.06)] N85-28353
Potential climatic impacts of increasing atmospheric CO2 with emphasis on water availability and hydrology in the United States
[NASA-TM-87479] N85-28517
Time-dependence of CO2-induced climate change
[DE85-007568] N85-28525
Photosynthetic acclimation of Acer saccharum
[DE85-008247] N85-28536
CARBON FIBER REINFORCED PLASTICS
Development of a fuselage forward section in Carbon Fiber Reinforced Plastic (CFRP) type of construction
[MBB/LFA34/CFK/PUB/008] N85-27851
Integral profile method for production of carbon fiber sheets
[MBB/LFA34/CFK/PUB/006] N85-27975
Heat resistant Carbon Fiber Reinforced Plastics (CFRP) hardening equipment
[MBB/LFA33/CFK/PUB/007] N85-27976
CARBON ISOTOPES
Resonance ionization mass spectrometry of carbon
[DE85-009040] N85-28018
CARBON MONOXIDE
Hydrogen degradation of pipeline steels
[DE85-008930] N85-28101
CARBON STEELS
The state of martensite after quenching in a magnetic field
[BLL-BISI-TRANS-22297-(9022.06)] N85-28051
CARBON 12
Spin distributions in heavy ion fusion at and below the Coulomb barrier
[DE85-007817] N85-28751
CARBONATES
Molten carbonate fuel cell performance model update
[DE85-003356] N85-28454
CARBOXYLIC ACIDS
Fatty and aromatic acid catabolizing bacteria from methanogenic ecosystems
[DE85-008133] N85-28537
CARGO AIRCRAFT
USSR report: Transportation
[JPRS-UTR-84-025] N85-27841
Test flight of IL-76TD long-range transport variant N85-27842
CARTESIAN COORDINATES
Augmented weighted diamond force of the linear nodal scheme for Cartesian coordinate systems
[DE85-005631] N85-28679
CASCADE WIND TUNNELS
Methods for design aerodynamics of modern transport aircraft
[DFVLR-FB-85-05] N85-27838
CASES (CONTAINERS)
SRB filament wound case material property study
[NASA-CR-171469] N85-27940
CASTING
The influence of melting practice and of microalloying, with rare earth metals and with boron, on the quality of low-carbon steel
[BLL-BISI-22467-(9022.06)] N85-28036
Influence of temperature in melting and casting on quality of medium-alloy steel
[BLL-BISI-TRANS-22310-(9002.06)] N85-28137
Precision die forging of blades or gas turbines N85-28148
CATACLYSMIC VARIABLES
X-ray emission and the winds of cataclysmic variables
[DE85-007663] N85-28902
CATALOGS (PUBLICATIONS)
Catalog of research projects at Lawrence Berkeley Laboratory, 1985
[DE85-008679] N85-28869
CATALYSTS
The production of copper phthalocyanine and/or its derivatives
[NASA-TM-77629] N85-27983
Michelle-derived catalysts for extended Schulz-Flory
[DE85-005656] N85-28012
Correlation of zeolite ZSM-5 acid strength with catalytic activity and selectivity
[DE85-005415] N85-28013
Catalyst and reactor development for a liquid phase Fischer-Tropsch process
[DE85-005894] N85-28014
CATALYTIC ACTIVITY
The role of surface generated radicals in catalytic combustion N85-27869
Oxygen evolution on NiCo2O4 electrodes N85-28026
CATHODES
The loss of material from the cathode of metal arcs
[NASA-TM-77845] N85-27985
Continued development and testing of tungsten controlled porosity dispenser cathodes
[AD-A152505] N85-28090
Process for making electrodes for discharge tubes
[DE85-008898] N85-28247
Bifunctional oxygen electrodes
[DE85-006871] N85-28248
Electrodes for flash discharge lamps
[DE85-008897] N85-28250
Streak tube characterization
[DE85-009874] N85-28255
CATIONS
The electronic spectra of phthalocyanine radical anions and cations
[AD-A152328] N85-27986

CAVITIES
The definition and computation of a metric on plane curves. The meaning of a face on a geometric model
N85-28571
Incorporation of Monte Carlo electron interface studies into photon general cavity theory
[DE85-007674] N85-28772
CAVITY RESONATORS
Jinc-trap resonator
[AD-D011650] N85-28339
Chaos and order in an optical ring cavity
[CWI-AM-R8416] N85-28795
CELESTIAL MECHANICS
The study of the physics of cometary nuclei
[NASA-CR-175917] N85-28905
CELLS (BIOLOGY)
The dynamical behavior of the age-size-distribution of a cell population
[CWI-AM-R8414] N85-28536
CENTER OF MASS
Physics of (very) high energy e(+)-e(-) colliders
[DE85-008177] N85-28780
CENTRAL PROCESSING UNITS
A high-accuracy optical linear algebra processor for finite element applications
[NASA-CR-175894] N85-28858
CERAMIC NUCLEAR FUELS
Technological apparatus for laser treatment of materials N85-28174
CERAMICS
Sintering and properties of metal-ceramic alloys of the Kovar type
[BLL-BISI-TRANS-21822-(9022.06)] N85-28060
Preparation of silicon carbide-silicon nitride fibers by the pyrolysis of polycarboslazane precursors
[NASA-TM-86505] N85-28107
Ceramic applications in turbine engines
[NASA-CR-174715] N85-28109
Characterization of the fatigue and slow crack growth behavior of partially stabilized zirconia ceramics
[DE85-005240] N85-28113
Indirect brazing of structural ceramics for uncooled diesels
[DE85-005569] N85-28116
Microstructure-mechanical property relationships in transformation-toughened ceramics
[DE85-009722] N85-28117
Ac field-induced order in dense colloidal systems
[DE85-009107] N85-28119
Investigation of charge transport in the thermoelectret state of some ceramics and glasses
[DE85-009318] N85-28122
Development of high temperature resistant, noncorrosible, non-metallic ceramic materials, especially silicon nitride in gas turbine application
[BMFT-FB-T-85-015] N85-28125
Ceramic turbochargers: A case study of a near-term application of high-strength ceramics
[DE85-006495] N85-28379
Future of ceramic turbochargers: Promises and pitfalls
[DE85-006209] N85-28380
High temperature composite thermal storage systems
[DE85-005073] N85-28455
CEREBRAL CORTEX
Encapsulation and packaging of a semiconductor multielectrode array for cortical implantation
[AD-A153180] N85-28535
CERTIFICATION
Certifying complex digital systems on civil aviation aircraft N85-27907
CHANNELS (DATA TRANSMISSION)
Introduction to the IEEE-488 bus
[INPE-3316-NTE/227] N85-28613
CHAOS
Chaos and order in an optical ring cavity
[CWI-AM-R8416] N85-28795
CHARGE COUPLED DEVICES
Self-scanning MDS-integrated photosensor strip N85-28151
Pipelined programmable charge domain device
[AD-D011598] N85-28225
Techniques for operating Charge Coupled Devices (CCD's) in very high speed framing mode
[AD-A152078] N85-28238
CHARGE TRANSFER
Investigation of charge transport in the thermoelectret state of some ceramics and glasses
[DE85-009318] N85-28122
The mean trajectory approximation for charge and energy transfer processes at surfaces
[AD-A152706] N85-28830
CHARGED PARTICLES
Implications for supersymmetry of the CERN monojets
[DE85-006178] N85-28741
CHEMICAL ANALYSIS
Photoionization mass spectrometry with VUV hydrogen laser source
[AD-A153362] N85-28009
Examination of steels by chemical analysis for quality assurance
[BLL-BISI-TRANS-22068-(9022.06)] N85-28074
Proton induced X-ray emission method, its application in analytics N85-28178
Voltammetric analysis of ordnance materials. Part 2: A portable digital voltammeter for use with a silver wire working electrode
[AD-A152480] N85-28325
CHEMICAL BONDS
New examples of clusters, extended metal-metal bonding and interstitial derivatives
[DE85-005926] N85-28837
CHEMICAL COMPOSITION
High resolution spectroscopy of C13O16 in gas mixtures
[AD-A152625] N85-27991
Influence of structural state and alloy content of austenite on formation of martensitic phases in steels
[BLL-BISI-TRANS-22385-(9022.06)] N85-28068
The effect of microalloying with calcium and magnesium on the plasticity of Poldi AKN 20 Ni-based alloy
[BLL-BISI-TRANS-2174-(9022.06)] N85-28075
In situ HVEM studies of electron beam-driven composition changes in thin film alloys: Displacement-rate gradient effects
[DE85-007992] N85-28092
Application of scattering methods to the studies of the structure of polymer blends
[IFPR-13/1984] N85-28104
Chemicals identified in human biological media, a data base, volume 6, part 1
[DE85-008768] N85-28542
Adsorption of Hg on lunar samples
[DE85-007948] N85-28906
CHEMICAL EFFECTS
Detailed chemical kinetic study of the effect of molecular structure on autoignition of fuel-air mixtures
[DE85-004424] N85-28010
CHEMICAL LASERS
Rotational relaxation studies of hydrogen fluoride
[AD-A152711] N85-28734
CHEMICAL PROPERTIES
Liquid propellants for use in guns: A review
[AD-A153051] N85-28131
CHEMICAL PROPULSION
Primary propulsion of electrothermal, ion and chemical systems for space-based radar orbit transfer
[NASA-TM-87043] N85-27972
CHEMICAL REACTIONS
The production of copper phthalocyanine and/or its derivatives
[NASA-TM-77629] N85-27983
Investigation of reaction layer formation in high-load capacity lubricating oils
[MPA-83-01] N85-28381
Average collisional vibrational energy transfer quantities and the inversion temperature
[AD-A152674] N85-28733
CHEMICAL REACTORS
Preparation of polystryene latex particles in a rotating reactor
[NASA-CR-171475] N85-28108
CHILDREN
Oral discussion, group-to-individual transfer and achievement in cooperative learning groups
[AD-A153209] N85-28552
CHIPS (ELECTRONICS)
Goals, achievements of microelectronics program N85-28179
Modern equipment for manufacture of IC's in Hungary N85-28181
Measurement methods for accurate microwave characterization and modeling of MESFET chips
[AD-A152360] N85-28227
Encapsulation and packaging of a semiconductor multielectrode array for cortical implantation
[AD-A153180] N85-28535
Random access memory technologies
[AD-A153089] N85-28597
Speed-up techniques for complementary metal oxide semiconductor very large scale integration
[AD-A152466] N85-28829
CHIPS (MEMORY DEVICES)
The design of an adaptive predictive coder using a single-chip digital signal processor
[AD-A152461] N85-28231
CHIRAL DYNAMICS
Modern test of chiral anomalies
[DE85-005892] N85-28680
Lattice actions improved by block-spin renormalisation group and maximally symmetric lattices
[DE85-007416] N85-28841
CHOLESKY FACTORIZATION
Parallel Cholesky factorization on a multiprocessor
[DE85-008762] N85-28682
CHROMATOGRAPHY
Experiments on sorption characteristics of solid desiccant materials for solar desiccant cooling systems
[DE85-000542] N85-28019
CHROMIUM
Influence of manganese and heat treatment on structure and properties of Fe-0.1 percent-C-14 percent Cr-based steels
[BLL-BISI-TRANS-22299-(9022.06)] N85-28071
CHROMIUM COMPOUNDS
Properties of chromate coatings formed on electrolytic zinc substrates
[BLL-BISI-TRANS-22349-(9022.06)] N85-28052
CHROMIUM STEELS
The corrosion resistance of chromium-nickel steel containing rare-earth metals
[BLL-BISI-TRANS-22477-(9022.06)] N85-28041
Influence of heat treatment parameters on the properties of induction hardened Ni-Cr-Mo steels
[BLL-BISI-TRANS-2499-(9022.06)] N85-28053
Obtaining oxide films on surface of tubes of chromium-nickel steels
[BLL-BISI-TRANS-22478-(9022.06)] N85-28076
Dispersion-strengthened powder-metallurgical chromium steels
[BLL-BISI-TRANS-22323-(9022.06)] N85-28081
Study to optimize Cr-Mo steels to resist hydrogen and temper embrittlement
[DE85-005492] N85-28096
Influence of temperature in melting and casting on quality of medium-alloy steel
[BLL-BISI-TRANS-22310-(9902.06)] N85-28137
Study of a simulated test for assessing the machinability of steels
[BLL-BISI-TRANS-22344-(9022.06)] N85-28357
Fracture mechanics analysis of cold drawn Si-Cr valve steel
[BLL-BISI-TRANS-22216-(9022.06)] N85-28405
CHRONOMETERS
Timing-system design considerations for a mobile astrolabe N85-28309
CINEMATOGRAPHY
Sub-nanosecond cinematography in laser fusion research: Current techniques and applications at the Lawrence Livermore Laboratory
[DE85-007252] N85-28334
CIRCUIT BOARDS
Voltammetric analysis of ordnance materials. Part 2: A portable digital voltammeter for use with a silver wire working electrode
[AD-A152480] N85-28325
CIRCUIT BREAKERS
Derated application of parts for (Electronic Systems Division) systems development. Revision
[AD-A153299] N85-28246
CIRCUIT DIAGRAMS
Measured noise performance of a new method of frequency hopping
[AD-A152679] N85-28234
Development of new circuit symbols for binary logic elements
[MBB-Z-39/85-O] N85-28640
CIRCUIT RELIABILITY
Efficient VLSI (Very Large Scale Integration) fault simulation
[AD-A152661] N85-28233
Derated application of parts for (Electronic Systems Division) systems development. Revision
[AD-A153299] N85-28246
CIRCUITS
Numerical methods for stiff ordinary and elliptic partial differential equations
[AD-A153247] N85-28675
CIRCULAR ORBITS
Maximizing the semi-major axis for a freely coning solar sailcraft
[AD-A153175] N85-27938
CIRCULAR TUBES
Steel Tubes
[BLL-BISI-TRANS-22064-(9022.06)] N85-28369
CIVIL AVIATION
Certifying complex digital systems on civil aviation aircraft N85-27907
Operations research
[B8561897] N85-28712
CLADDING
New process for production of bimetal with corrosion-resistant cladding layer
[BLL-BISI-TRANS-22371-(9022.06)] N85-28056

CLASSICAL MECHANICS
How a swing behaves
[DE85-008280] N85-28720
CLASSIFICATIONS
New method of calculating the economic effects of corrosion
[BLL-BISI-TRANS-22348-(9022.06)] N85-28079
CLIMATE
Time-dependence of CO2-induced climate change
[DE85-007568] N85-28525
CLIMATOLOGY
Centralized Storm Information System (CSIS)
[NASA-CR-175898] N85-28506
A report from the Space Science and Engineering Center, the University of Wisconsin-Madison, Madison, Wisconsin N85-28507
CSIS test and evaluation N85-28509
Potential climatic impacts of increasing atmospheric CO2 with emphasis on water availability and hydrology in the United States
[NASA-TM-87479] N85-28517
Air Weather Service (AWS) climatic briefs: Europe
[AD-A152528] N85-28519
Characteristics of North Indian Ocean tropical cyclone activity
[AD-A153085] N85-28524
Mathematical modeling and simulation of climate and climatic change
[DE85-008974] N85-28526
CLOCKS
Proceedings of the Fifteenth Annual Precise Time and Time Interval (PTTI) Applications and Planning Meeting
[AD-A149163] N85-28287
Unattended TV time transfer results N85-28305
Clock characterization tutorial N85-28311
A plan for the development of inertial reconstruction of initial state clock (IRIS) N85-28317
CLOUD CHAMBERS
An experimental investigation of the angular scattering and backscattering behaviors of the simulated clouds of the outer planets
[NASA-CR-175909] N85-28896
CLOUD PHYSICS
An experimental investigation of the angular scattering and backscattering behaviors of the simulated clouds of the outer planets
[NASA-CR-175909] N85-28896
CLOUDS (METEOROLOGY)
Presentations at the Tri-Service Cloud Modeling Workshop (2nd), held at the Naval Surface Weapons Center, White Oak, Maryland, 26-27 June 1984, volume 1
[AD-A152735] N85-28522
CLUMPS
Clusters of transition metal atoms
[AD-A153126] N85-28740
Large, energetic cluster impacts on surfaces
[DE85-006559] N85-28769
CMOS
Speed-up techniques for complementary metal oxide semiconductor very large scale integration
[AD-A152466] N85-28829
COATINGS
High-altitude testing of selective optical coatings for solar radiators and collectors N85-28143
Heat pipe and method of making same
[AD-D011654] N85-28273
Raman studies of laser damaged single and multi-layer optical coatings
[DE85-009431] N85-28351
COAXIAL CABLES
Basic EMC technology advancement for C3 systems. Volume 4F: Prediction of crosstalk in flatpack coaxial cables
[AD-A153111] N85-28242
COBALT
Neutron scattering and reactions on 59Co from 1 to 20 MeV
[AERE-R-11439] N85-28729
CODERS
A software simulation study of a (255,223) Reed-Solomon encoder-decoder
[NASA-CR-175872] N85-28192
CODING
Alphabet-constrained data compression
[AD-A152887] N85-28667
Fourier coding and reconstruction of complicated contours
[REPT-84-39] N85-28691
System of white-light density pseudocolor encoding with three primary colors
[AD-D011651] N85-28791
COGNITION
Verbal information processing paradigms: A review of theory and methods
[AD-A153229] N85-28880
COGNITIVE PSYCHOLOGY
The levels of processing conceptualization of human memory: Some empirical and theoretical issues
[AD-A152321] N85-28544
Identifying solution paths in cognitive diagnosis
[AD-A152463] N85-28549
COLD CATHODE TUBES
Process for making electrodes for discharge tubes
[DE85-008898] N85-28247
COLD DRAWING
Fracture mechanics analysis of cold drawn Si-Cr valve steel
[BLL-BISI-TRANS-22216-(9022.06)] N85-28405
COLD ROLLING
Effect of texture in steel on the susceptibility of hydrogen embrittlement
[BLL-BISI-TRANS-22026-(9022.06)] N85-28048
Influence of preliminary thermomechanical treatment on depth and hardness of nitrided layers
[BLL-BISI-TRANS-22488-(9022.06)] N85-28078
COLD WORKING
Preparation of metal for cold upsetting
[BLL-BISI-TRANS-22383-(9022.06)] N85-28043
COLLIMATORS
Muon spin rotation studies N85-28819
COLLISION PARAMETERS
Experiments and detectors for high energy heavy ion colliders
[DE85-007927] N85-28748
COLLISIONAL PLASMAS
Fluid modeling of magnetized plasmas
[DE85-007679] N85-28804
COLLISIONS
Average collisional vibrational energy transfer quantities and the inversion temperature
[AD-A152674] N85-28733
COLLOIDS
Ac field-induced order in dense colloidal systems
[DE85-009107] N85-28119
COLOR
System of white-light density pseudocolor encoding with three primary colors
[AD-D011651] N85-28791
COLORIMETRY
System of white-light density pseudocolor encoding with three primary colors
[AD-D011651] N85-28791
COLUMNS (SUPPORTS)
Support structures for optical components in the Laser Demonstration Facility
[DE85-008879] N85-28349
COMBUSTION
Combustion and micro-explosion of water/oil emulsions in high pressure environments
[AD-A152960] N85-27997
Photochemical ignition studies. 1: Laser ignition of flowing premixed gases
[AD-A153048] N85-28002
Elementary reactions of importance in oxidation, combustion ignition and flame inhibitions
[AD-A153139] N85-28004
COMBUSTION CHAMBERS
Segmented zoned fuel injection system for use with a combustor
[AD-D011640] N85-27865
Predictions and measurements of isothermal flowfields in axisymmetric combustor geometries
[NASA-CR-174916] N85-27867
The role of surface generated radicals in catalytic combustion N85-27869
Future fundamental combustion research for aeropropulsion systems
[NASA-TM-87049] N85-27870
Reaction-bonded and fiber-reinforced SiC static and dynamic gas turbine components
[BMFT-FB-T-84-302] N85-27874
Polynomial approaches for the characteristic velocity and flame temperature as a function of mixing compounding and pressure for the systems PMMA/O2, PMMA/air, PE/O2, PE/air, PS/O2 and PS/air
[VTH-LR-421] N85-28024
COMBUSTION EFFICIENCY
The role of surface generated radicals in catalytic combustion N85-27869
SSME fuel prebumer two-dimensional analysis N85-27943
COMBUSTION PRODUCTS
Jet fuel instability mechanisms
[NASA-CR-175856] N85-28127
COMETARY ATMOSPHERES
Cometary atmospheres: Modeling the spatial distribution of observed neutral radicals
[NASA-CR-175882] N85-28904
The study of the physics of cometary nuclei
[NASA-CR-175917] N85-28905
COMETS
Study of the accuracy of astrometric observations of comets
[ESA-CR(P)-1964] N85-28903
Cometary atmospheres: Modeling the spatial distribution of observed neutral radicals
[NASA-CR-175882] N85-28904
The study of the physics of cometary nuclei
[NASA-CR-175917] N85-28905
COMMAND AND CONTROL
A study of error rates in voice recognition
[AD-A153282] N85-28211
Rome Development Center Air Force technical objective document C3I FY-86
[AD-A152476] N85-28851
COMMERCIAL AIRCRAFT
Demonstration of relaxed static stability on a commercial transport N85-27898
Realisation of relaxed static stability on a commercial transport N85-27899
COMMERCIAL SPACECRAFT
The Ariane launch vehicle is the key of the Europeans to the space market N85-27931
COMMUNICATION NETWORKS
Wideband integrated voice/data technology
[AD-A152329] N85-28197
Logical design of a decision support system to forecast technology, prices and costs for the national communications system
[AD-A152330] N85-28198
A real-time executive for multiple-computer clusters
[AD-A152961] N85-28646
COMMUNICATION SATELLITES
FAA (Federal aviation administration) assessment of satellite concepts and aviation spectrum requirements
[AD-A152338] N85-28199
Spread spectrum time transfer experiment via INTELSAT N85-28304
COMMUNICATION THEORY
Algebra of communicating processes
[CWI-CS-R8421] N85-28214
Expressiveness and language choice
[AD-A153280] N85-28623
COMPACTING
Ac field-induced order in dense colloidal systems
[DE85-009107] N85-28119
Hot Isostatic Pressing (HIP): Techniques, applications and economical use
[JUEL-SPEZ-268] N85-28141
COMPARISON
Self-scanning MDS-integrated photosensor strip N85-28151
COMPENSATORS
Principles of designing digital compensating accelerometers N85-28172
COMPONENT RELIABILITY
Experimental measurements and analysis of heat transfer and gas dynamics in a rotating turbine stage N85-27949
Flow-induced vibration of SSME main injector liquid-oxygen posts N85-27951
Composite loads spectra for select space propulsion structural components N85-27953
Development of high temperature resistant, noncorrosible, non-metallic ceramic materials, especially silicon nitride in gas turbine application
[BMFT-FB-T-85-015] N85-28125
COMPOSITE MATERIALS
Friction and wear behavior of aluminum and composite I-beam stiffened airplane skins
[NASA-TM-86418] N85-27852
Gordon Research Conference on Composites
[AD-A152988] N85-27979
Solution to eigenvalue problems of antisymmetric cross-ply and antisymmetric angle-ply laminated plates using affine transformations
[AD-A153040] N85-27980
Interaction among inhomogeneities and inclusions
[AD-A153114] N85-28419
Analytical shear buckling investigation of curved composite panels
[AD-A153138] N85-28421
High temperature composite thermal storage systems
[DE85-005073] N85-28455
COMPOSITE STRUCTURES
Effects of the phase compositions of cast low-pearlite steels micro-alloyed with vanadium and titanium of their structure and properties
[BLL-BISI-TRANS-22301-(9022.06)] N85-28057
Initial imperfection surveys on conical shells at Hoechst AG
[VTH-LR-407] N85-28429
COMPRESSIBLE FLOW
Calculation of viscous compressible flows in small gas turbines N85-27950
Supersonic flow around blunt wedge N85-28158

COMPRESSOR BLADES
Precision die forging of blades or gas turbines N85-28148

COMPRESSOR ROTORS
Ceramic turbochargers: A case study of a near-term application of high-strength ceramics
[DE85-006495] N85-28379

COMPRESSORS
Testing of materials and coatings for jet engine components under simulated operational conditions
[B8580073] N85-27873

COMPUTATION
Heating parameter estimation using coaxial thermocouple gages in wind tunnel test articles
[AD-A153039] N85-28328
The definition and computation of a metric on plane curves. The meaning of a face on a geometric model N85-28571
Software environment for conducting interactive statistical analysis
[AD-A153378] N85-28626
Projected discrete ordinates methods for numerical transport problems
[DE85-005632] N85-28678
Augmented weighted diamond force of the linear nodal scheme for Cartesian coordinate systems
[DE85-005631] N85-28679
An examination of the use of wave packets for the calculation of atom diffraction by surface
[AD-A152760] N85-28735

COMPUTATIONAL FLUID DYNAMICS
Future fundamental combustion research for aeropropulsion systems
[NASA-TM-87049] N85-27870
CALTECH-DOE program on numerical analysis, computing and fundamental studies of motion, energy and mass transfer in fluids
[DE85-008106] N85-28274
A second-order pressure-correction method for viscous incompressible flow
[REPT-84-15] N85-28280

COMPUTATIONAL GRIDS
Computational Geometry and Computer-Aided Design
[NASA-CP-2379] N85-28563
Examination of the circle spline routine N85-28573
Parameterization in grid generation N85-28581
Contouring trivariate data N85-28582
Generation of surface coordinates by elliptic partial differential equations N85-28583
A survey of composite grid generation for general three-dimensional sections N85-28584
A discussion of adaptive grids and their applicability in numerical hydrodynamic modeling
[AD-A151843] N85-28659

COMPUTER AIDED DESIGN
Aerodynamic research in preparation for a new Dutch transport aircraft with supercritical wings
[B8580077] N85-27836
Methods for design aerodynamics of modern transport aircraft
[DFVLR-FB-85-05] N85-27838
USAF damage tolerant design handbook: Guidelines for the analysis and design of damage tolerant aircraft structures, revision B
[AD-A153161] N85-27858
Engineering robot actions in a computer integrated manufacturing environment
[CWI-CS-R8415] N85-28139
Future directions of robotics, automation in Italy N85-28187
Report on high intensity solar cells
[DE85-006396] N85-28462
Computational Geometry and Computer-Aided Design
[NASA-CP-2379] N85-28563
Multivariate spline algorithms for CAGD N85-28566
A survey of patch methods N85-28567
Boundary to constructive solid geometry mapings: A focus on 2-D issues N85-28570
Adapting shape parameters for cubic Bezier curves N85-28576
Triangular Berstein-Bezier patches, a survey and new results N85-28577
A uniform subdivision method for triangular Bezier patches N85-28578
An intuitive approach to geometric continuity for parametric curves and surfaces (extended abstract) N85-28579
Urn models and beta-splines N85-28580
A unified representation scheme for solid geometric objects using B-splines (extended abstract) N85-28585
Improving the effectiveness of integral property calculation in a CSG solid modeling system by exploiting predictability N85-28586
Spline curves, wire frames and B-value N85-28587
A new technique for system-to-system transfer of surface data N85-28589
Curved finite elements and curve approximation N85-28590
Comparison of two algebraic methods for curve/curve intersection N85-28591
Manufacturing information system
[AD-A152715] N85-28616
A modern control theory enhancement to an Interactive Control Engineering Computer Analysis Package (ICECAP)
[AD-A153249] N85-28622

COMPUTER AIDED MANUFACTURING
Engineering robot actions in a computer integrated manufacturing environment
[CWI-CS-R8415] N85-28139
The application of numerical control (NC) in manufacturing wind tunnel models
[B8580078] N85-28140
A new technique for system-to-system transfer of surface data N85-28589
Comparison of two algebraic methods for curve/curve intersection N85-28591
Manufacturing information system
[AD-A152715] N85-28616

COMPUTER GRAPHICS
The interactive generation of specifications for an onboard software series (GISELE) N85-27906
FLOWPLOT 2: A fluid dynamics and heat transfer plotting package
[DE85-009802] N85-28277
Free-form design in solid modelling N85-28569
Boundary to constructive solid geometry mapings: A focus on 2-D issues N85-28570
Examination of the circle spline routine N85-28573
A natural bias approach to cardinal spline curves N85-28575
Adapting shape parameters for cubic Bezier curves N85-28576
Triangular Berstein-Bezier patches, a survey and new results N85-28577
A uniform subdivision method for triangular Bezier patches N85-28578
An intuitive approach to geometric continuity for parametric curves and surfaces (extended abstract) N85-28579
Urn models and beta-splines N85-28580
Parameterization in grid generation N85-28581
Contouring trivariate data N85-28582
Generation of surface coordinates by elliptic partial differential equations N85-28583
A survey of composite grid generation for general three-dimensional sections N85-28584
A unified representation scheme for solid geometric objects using B-splines (extended abstract) N85-28585
Improving the effectiveness of integral property calculation in a CSG solid modeling system by exploiting predictability N85-28586
Looking at more than three dimensions
[DE85-007764] N85-28600
Tracking algorithm performance analysis program (TRAPP)
[DE85-007304] N85-28601
Computing environments for data analysis. Part 1: Introduction
[DE85-007919] N85-28603
Computing environments for data analysis. Part 2: Hardware
[DE85-008320] N85-28604
Research in computer science
[NASA-CR-175922] N85-28612
AFIT GKS: A GKS implementation in the Ada programming language
[AD-A152954] N85-28620
Study of raster metafile formats
[AD-A153322] N85-28624
The addition of advanced scene rendering techniques to a general purpose graphics package
[AD-A153323] N85-28625
Software environment for conducting interactive statistical analysis
[AD-A153378] N85-28626
Introduction to LINE: A Feynman diagram graphic operator
[DE85-009299] N85-28632
Ray tracing general sweep defined objects
[REPT-84-36] N85-28636
Fourier coding and reconstruction of complicated contours
[REPT-84-39] N85-28691

COMPUTER INFORMATION SECURITY
NASA guidelines for assuring the adequacy and appropriateness of security safeguards in sensitive applications
[NASA-CR-175489] N85-28593
A secure high-speed transaction protocol
[CWI-CS-R8417] N85-28605

COMPUTER NETWORKS
There is no I/O like no I/O
[DE85-009115] N85-28634
System Analysis for the Huntsville Operation Support Center, Distributed Computer System
[NASA-CR-171506] N85-28642
Interfacing the VAX 11/780 using Berkeley Unix 4.2.BSD and Ethernet based Xerox network systems, volume 1
[AD-A152953] N85-28645
Distributed systems management in wide area networks
[CWI-CS-R8419] N85-28651
Distributed matchmaking for processes in computer networks
[CWI-CS-R8421] N85-28652
Distributed elections in a ring of processors using Archimedean time
[CWI-CS-R8416] N85-28653

COMPUTER PROGRAMMING
A method to calculate the parameters of wings of arbitrary planform
[AD-A152689] N85-27831
Investigation and implementation of a tree transformation system for user friendly programming
[AD-A152716] N85-28617
Sample problems for STAGSC-1
[AD-A153142] N85-28621
A modern control theory enhancement to an Interactive Control Engineering Computer Analysis Package (ICECAP)
[AD-A153249] N85-28622
Software for estimating sparse Hessian matrices
[DE85-008121] N85-28629
Introduction to LINE: A Feynman diagram graphic operator
[DE85-009299] N85-28632
Towards a uniform topological treatment of streams and functions on streams
[CWI-CS-R8422] N85-28639
Parallel Cholesky factorization on a multiprocessor
[DE85-008762] N85-28682

COMPUTER PROGRAMS
Users manual for coordinate generation code CRDSRA
[NASA-CR-172584] N85-27824
User's manual for airfoil flow field computer code SRAIR
[NASA-CR-172585] N85-27825
Addition of flexible body option to the TOLA computer program, part 1
[NASA-CR-132732-1] N85-27855
Addition of flexible body option to the TOLA computer program. Part 2: User and programmer documentation
[NASA-CR-132732-2] N85-27856
Predictions and measurements of isothermal flowfields in axisymmetric combustor geometries
[NASA-CR-174916] N85-27867
Operational and developmental experience with the F/A-18A digital flight control system N85-27895
Certifying complex digital systems on civil aviation aircraft N85-27907
SRB filament wound case material property study
[NASA-CR-171469] N85-27940
Composite loads spectra for select space propulsion structural components: Probabilistic load model development N85-27954
Probabilistic finite element development N85-27956
Structural tailoring of SSME blades (vanes) N85-27960
Electromagnetic transmission through a slot in a perfectly conducting plane
[AD-A153224] N85-28210
Restructurable VLSI (Very large scale integration) program
[AD-A152340] N85-28226
Analysis of physical-chemical processes governing SSME internal fluid flows
[NASA-CR-175893] N85-28261
FLOWPLOT 2: A fluid dynamics and heat transfer plotting package
[DE85-009802] N85-28277
Voltammetric analysis of ordnance materials. Part 2: A portable digital voltammeter for use with a silver wire working electrode
[AD-A152480] N85-28325
Documentation of PHOTO: A user's manual for the analysis of photographic and X-ray negatives
[AD-A152988] N85-28327
Heating parameter estimation using coaxial thermocouple gages in wind tunnel test articles
[AD-A153039] N85-28328
Multi-mesh gear dynamics program evaluation and enhancements
[NASA-CR-174747] N85-28372

System analysis of a field Army Topographic Support System
[AD-A153318] N85-28439
A program for the calculation of paraboloidal-dish solar thermal power plant performance
[NASA-CR-175874] N85-28449
Report on high intensity solar cells
[DE85-008398] N85-28462
Two-dimensional inverse kinematic problem: Application to the Saudi Arabian refraction profile N85-28478
Crustal structure of the Red Sea-Arabian Shield transition N85-28479
Centralized Storm Information System (CSIS)
[NASA-CR-175898] N85-28506
A survey of composite grid generation for general three-dimensional sections N85-28584
A new technique for system-to-system transfer of surface data N85-28589
Language design, computers and brains
[AD-A152819] N85-28594
Optical phenomena in computer vision
[AD-A152970] N85-28595
Tracking algorithm performance analysis program (TRAPP)
[DE85-007304] N85-28601
COSMIC Software Catalog, 1985 edition
[NASA-CR-174070] N85-28608
Automatic distribution of programs in MASCOT and Ada (trademark) environments: A feasibility study
[AD-A152665] N85-28614
Implementation of a general finite element code on an IBM PC compatible microcomputer
[AD-A152681] N85-28615
CLEANROOM software development: An empirical evaluation
[AD-A152924] N85-28619
The addition of advanced scene rendering techniques to a general purpose graphics package
[AD-A153323] N85-28625
Evidential reasoning in expert systems for image analysis
[AD-A153379] N85-28627
TRINITY: A pre- and post-processing program for 2-dimensional finite element data
[DE85-008029] N85-28628
Numerical benchmark study for the finite element computer code NEPTUNE
[DE85-008400] N85-28630
VULTURE manual
[DE85-008673] N85-28631
CAMAC 488 module: 68000 based GPIB interface module
[DE85-009367] N85-28635
Analytical generation of satellite orbits at the RAE (Royal Aircraft Establishment)
[AD-A152655] N85-28901

COMPUTER SYSTEMS DESIGN

Development of a microprocessor controlled communication system for ships
[BMFT-FB-T-84-275] N85-28216
VLSI workshop and project: February - November 1982
[WSRL-0374-TR] N85-28223
CAMAC 488 module: 68000 based GPIB interface module
[DE85-009367] N85-28635
A programming system for a modular flexible multimicrocomputer system for the automatic control of automated test equipment
[JUEL-1962] N85-28641
System Analysis for the Huntsville Operation Support Center, Distributed Computer System
[NASA-CR-171506] N85-28642
The design of a capability-based distributed operating system
[CWI-CS-R8418] N85-28650
The IRAS end-to-end data system
[NLR-MP-83056-U] N85-28683
The development of information systems at NLR
[B8580079] N85-28684

COMPUTER SYSTEMS PERFORMANCE

There is no I/O like no I/O
[DE85-009115] N85-28634

COMPUTER SYSTEMS PROGRAMS

A secure high-speed transaction protocol
[CWI-CS-R8417] N85-28605
Research in computer science
[NASA-CR-175922] N85-28612
CLEANROOM software development: An empirical evaluation
[AD-A152924] N85-28619
Software environment for conducting interactive statistical analysis
[AD-A153378] N85-28626
Software for estimating sparse Hessian matrices
[DE85-008121] N85-28629
Optimal design and use of retry in fault tolerant real-time computer systems
[NASA-CR-175920] N85-28643
A program for solving first kind Fredholm integral equations by means of regularization
[CWI-NM-R8416] N85-28697

COMPUTER TECHNIQUES

ACT applied to helicopter flight control N85-27891
Some flight test results with redundant digital flight control systems N85-27892
Evaluation of used crankcase oils using computerized infrared spectrometry
[AD-A152993] N85-27999
Evaluation of used crankcase oils using computerized infrared spectrometry. Appendices
[AD-A152994] N85-28000
Automation of Precise Time Reference Stations (PTRS) N85-28291
US Naval Observatory collection and utilization of time comparison data N85-28292
Documentation of PHOTO: A user's manual for the analysis of photographic and X-ray negatives
[AD-A152988] N85-28327
Generation and display apparatus
[AD-D011639] N85-28599
Microprocessor controlled temperature chassis
[DE85-008392] N85-28602
Computer program for prediction of capture maneuver probability for an on-off reaction controlled upper stage
[NASA-CR-165937] N85-28611
Interfacing the VAX 11/780 using Berkeley Unix 4.2.BSD and Ethernet based Xerox network systems, volume 1
[AD-A152953] N85-28645
Computing in the Soviet general economy: An introductory overview
[AD-P004563] N85-28858

COMPUTER VISION

Optical phenomena in computer vision
[AD-A152970] N85-28595

COMPUTERIZED SIMULATION

Addition of flexible body option to the TOLA computer program. Part 2: User and programmer documentation
[NASA-CR-132732-2] N85-27856
OLGA: An open loop gust alleviation system N85-27897
Simulation of multistage turbine flows N85-27945
Calculation of viscous compressible flows in small gas turbines N85-27950
Stressed-strained state of tightening buckles in sectional runners of gas turbines N85-28149
Performance evaluation of fiber-optic converters N85-28154
A software simulation study of a (255,223) Reed-Solomon encoder-decoder
[NASA-CR-175872] N85-28192
Analysis and modeling for thermal focal plane arrays
[AD-A153156] N85-28329
System analysis of a field Army Topographic Support System
[AD-A153318] N85-28439
Comparison of measurement and simulation results of radiation temperatures applied to the thermal mapping of Munich
[DFVLR-FB-85-06] N85-28442
Simplified analysis of Stirling engines and heat pumps
[DE85-008753] N85-28457
Comprehensive silicon solar cell computer modeling
[NASA-CR-175959] N85-28461
Performance of an active/passive hybrid solar system utilizing vapor transport
[DE85-008627] N85-28466
A crustal section for the Arabian Shield and adjacent Red Sea margin derived from first-arrival data N85-28480
A seismic refraction profile across the Arabian Shield N85-28481
Technical evaluation of the Naval Automated Pilot Aptitude Measurement System (NAPAMS)
[AD-A152361] N85-28547
Computer program for prediction of capture maneuver probability for an on-off reaction controlled upper stage
[NASA-CR-165937] N85-28611
Manufacturing information system
[AD-A152715] N85-28616
VULTURE manual
[DE85-008673] N85-28631
Adding computationally efficient realism to Monte Carlo turbulence simulation
[NASA-TP-2469] N85-28708
Operations research
[B8561897] N85-28712
Theoretical studies of heavy ion scattering processes
[DE85-008823] N85-28753
Multiple time-scale methods in particle simulations of plasmas
[DE85-007519] N85-28808

COMPUTERS

East Europe report: Science and technology
[JPRS-ESA-85-017] N85-28177
The touch panel system: Design and development
[AD-A153014] N85-28596
Efforts at office automation and information systems utilization at Martin Marietta Energy Systems, Incorporated
[DE85-008154] N85-28633
Synchronization and fault-masking in redundant real-time systems
[NASA-TM-87478] N85-28644
European Science Notes, Volume 39, Number 3
[AD-A152446] N85-28717
Computing in the Soviet general economy: An introductory overview
[AD-P004563] N85-28858
A study of user-defined searching requirements for the on-line version of the directory of DOD-sponsored R and D data bases on the Defense Gateway computer system
[AD-A153000] N85-28878

CONCENTRATORS

Development of mass-producible line-focus tracking concentrating solar collectors. Category 2: Control systems
[DE85-007873] N85-28459
Development of a second-generation linear Fresnel Photovoltaic and Thermal (PVT) concentrator array, including fabrication and installation of a 200 square meter collector field
[DE85-008473] N85-28465
DOE/Sandia point-focus concentrator program, draft
[DE85-008209] N85-28793

CONCRETES

Development of concrete polymer materials
[DE85-005957] N85-28114

CONDENSATES

Proper quality of anticorrosion work no matter how bad the atmospheric conditions
[BLL-BISI-TRANS-22080-(9022.06)] N85-28383

CONDENSING

Experimental and theoretical study of condensation in multicomponent vapors
[DE85-009357] N85-28021

CONDITIONING (LEARNING)

M-BLASER: A device to study pursuit tracking in the rhesus monkey
[AD-A152986] N85-28534

CONFERENCES

Active Control Systems: Review, Evaluation and Projections
[AGARD-CP-384] N85-27883
Adaptive wall wind tunnels and wall interference correction methods
[DFVLR-IB-222-84-A-37] N85-27912
Structural Integrity and Durability of Reusable Space Propulsion Systems
[NASA-CP-2381] N85-27941
Systematic nomenclature of the nitrogen, oxygen and sulfur functional polycyclic aromatic hydrocarbons
[DE85-007426] N85-27974
Gordon Research Conference on Composites
[AD-A152888] N85-27979
Proceedings of the 9th US Air Force and the Federal Republic of Germany Data Exchange Agreement Meeting, Viscous and Interacting Flow Field Effects
[AD-A153020] N85-28266
Airphoto interpretation of vegetation and landforms for soil mapping N85-28436
Presentations at the Tri-Service Cloud Modeling Workshop (2nd), held at the Naval Surface Weapons Center, White Oak, Maryland, 26-27 June 1984, volume 1
[AD-A152735] N85-28522
Peer Review of a Formal Verification/Design Proof Methodology
[NASA-CP-2377] N85-28609
Science and Technology in the Soviet Union
[AD-A152828] N85-28856

CONFIDENCE LIMITS

Confidence intervals based on interpolated order statistics
[AD-A152607] N85-28701

CONFORMAL MAPPING

Chaos and order in an optical ring cavity
[CWI-AM-R8416] N85-28795

CONGRESSIONAL REPORTS
The Department of Defense statement on the Science and Technology Program by Colonel Donald I. Carter, USAF Acting Deputy Under Secretary of Defense for Research and Advanced Technology before the Subcommittee on Research and Development of the Committee on Armed Services of the United States House of Representatives, 99th Congress, first session
[AD-A152467] N85-28850
National Aeronautics and Space Administration Authorization Act, 1986
[S-REPT-99-91] N85-28885
Report to Congress on the Automotive Technology Development Program
[DE85-005640] N85-28890

CONGRUENCES
Algebra of communicating processes
[CWI-CS-R8421] N85-28214
A complete inference system for regular processes with silent moves
[CWI-CS-R8420] N85-28638

CONICAL SHELLS
Initial imperfection surveys on conical shells at Hoechst AG
[VTH-LR-407] N85-28429

CONSTRAINTS
On the exceedance point process for a stationary sequence
[AD-A152827] N85-28665

CONSTRUCTION
Evidential reasoning in expert systems for image analysis
[AD-A153379] N85-28627
A bilaterally deterministic rho-mixing stationary random sequence
[AD-A152856] N85-28666

CONTAMINANTS
A study of gas solid reactions using coated piezoelectric detectors
[AD-A153047] N85-28001

CONTINENTAL SHELVES
An assessment of the potential role of multispectral imagery in bathymetric charting
[AD-A152460] N85-28438

CONTINGENCY
An examination of alternative forms of fit in contingency theory
[AD-A152602] N85-28853
The concept of fit in contingency theory
[AD-A152603] N85-28854

CONTINUOUS WAVE LASERS
Design and construction of a CW ND:YAG laser using a single elliptical cavity and water cooled krypton arc lamp pumping
[AD-A152657] N85-28340

CONTINUUM MECHANICS
The Shock and Vibration Digest, volume 17, no. 1
[AD-A151051] N85-28397
Continuum modeling of latticed structures N85-28399
Nonlinear problems in continuum mechanics
[AD-A153387] N85-28846

CONTOURS
Contouring trivariate data N85-28582
Fourier coding and reconstruction of complicated contours
[REPT-84-39] N85-28691

CONTRACT MANAGEMENT
R/D contracts in the Soviet Union
[AD-P004569] N85-28865

CONTRACTS
R/D contracts in the Soviet Union
[AD-P004569] N85-28865

CONTROL BOARDS
The touch panel system: Design and development
[AD-A153014] N85-28596

CONTROL EQUIPMENT
Development of a multiprocessor system, using the MOTORLA microprocessor 6809, with the aim of providing maximum flexibility in the design of individual control devices
[BMFT-FB-T-84-270] N85-28607

CONTROL SIMULATION
In-flight investigation of the influence of pitch damping and pitch control effectiveness on landing approach flying qualities of statically unstable transport aircraft
[DFVLR-FB-84-12] N85-27880

CONTROL SURFACES
X-29 digital flight control system design N85-27889
The aerodynamics of control N85-27901
Method of calculating separation flow of subsonic gas stream around wings N85-28161

CONTROL SYSTEMS DESIGN
The state-of-the-art and future of flight control systems N85-27885
Aspects of application of ACT systems for pilot workload alleviation N85-27887
Application of AFTI/F-16 task-tailored control modes in advanced multirole fighters N85-27888
X-29 digital flight control system design N85-27889
The evolution of ACS for helicopters: Conceptual simulation studies to preliminary design N85-27890
ACT applied to helicopter flight control N85-27891
An update of experience on the fly by wire Jaguar equipped with a full-time digital flight control system N85-27893
ACT flight research experience N85-27894
Operational and developmental experience with the F/A-18A digital flight control system N85-27895
Flight testing and development of the F/A-18A digital flight control system N85-27896
OLGA: An open loop gust alleviation system N85-27897
A modular dissimilar redundant computer designed for high integrity control N85-27904
The flight control system for the Experimental Aircraft Programme (EAP) demonstration aircraft N85-27908
Automatic flight control modes for the AFTI/F-111 mission adaptive wing aircraft N85-27909
The STOL and maneuver technology program integrated control system development N85-27910
Development of a multiprocessor system, using the MOTORLA microprocessor 6809, with the aim of providing maximum flexibility in the design of individual control devices
[BMFT-FB-T-84-270] N85-28607
A modern control theory enhancement to an Interactive Control Engineering Computer Analysis Package (ICECAP)
[AD-A153249] N85-28622

CONTROL THEORY
Design of robust controllers for a multiple input-multiple output control system with uncertain parameters application to the lateral and longitudinal modes of the KC-135 transport aircraft
[AD-A153100] N85-27877
Controller requirements for uncoupled aircraft motion, volume 1
[AD-A153173] N85-27878
Controller requirements for uncoupled aircraft motion, volume 2
[AD-A153300] N85-27879
Active Control Systems: Review, Evaluation and Projections
[AGARD-CP-384] N85-27883
Hand controllers for teleoperation. A state-of-the-art technology survey and evaluation
[NASA-CR-175890] N85-28559
A modern control theory enhancement to an Interactive Control Engineering Computer Analysis Package (ICECAP)
[AD-A153249] N85-28622
Scalar modal control of a nonlinear system using time varying gain
[AD-A153252] N85-28676

CONTROLLABILITY
A preliminary investigation of handling qualities requirements for helicopter instrument flight during decelerating approach maneuvers and overshoot
[NRC-24173] N85-27857
ACT flight research experience N85-27894
How to handle failures in advanced flight control systems of future transport aircraft N85-27905

CONTROLLERS
Design of robust controllers for a multiple input-multiple output control system with uncertain parameters application to the lateral and longitudinal modes of the KC-135 transport aircraft
[AD-A153100] N85-27877
Controller requirements for uncoupled aircraft motion, volume 2
[AD-A153300] N85-27879
ACT applied to helicopter flight control N85-27891
A ten channel temperature controller
[AD-A152664] N85-28326
Scalar modal control of a nonlinear system using time varying gain
[AD-A153252] N85-28676
A proportional-plus-integral controller for a particle beam weapon
[AD-A153213] N85-28778

CONVECTION
Centralized Storm Information System (CSIS)
[NASA-CR-175898] N85-28506

CONVECTION CLOUDS
Statistical comparison of radar echoes of convective precipitation between the northern Alps and its foreland
[DFVLR-FB-85-07] N85-28215

CONVECTIVE HEAT TRANSFER
Unsteady heat transfer due to time-dependent free stream velocity N85-27947
Effects of the corona wind on the cooling of a horizontal cylinder
[AD-A153101] N85-28241
Heat transfer in pipes
[NASA-TM-77838] N85-28262

CONVERGENCE
Convergence of Newton's method for a single real equation
[NASA-TP-2489] N85-28656

CONVEXITY
Convex interpolating splines of arbitrary degree N85-28574

CONVOLUTION INTEGRALS
Generalised translation invariance and systems theory
[CRM-8501] N85-28657
Deconvolution methods for multi-sensors
[AD-A152351] N85-28660
A convolution integral equation solved by Laplace transformation
[CWI-AM-R8409] N85-28692

COOLING
Multi-phase crystallization of ferrous alloys
[BLL-BISI-TRANS-22441-(9022.06)] N85-28037
Production and compaction of amorphous metal powders
[BLL-BISI-TRANS-22387-(9022.06)] N85-28080
Performance analysis of radiation cooled dc transmission lines for high power space systems
[NASA-TM-87040] N85-28222
Effects of the corona wind on the cooling of a horizontal cylinder
[AD-A153101] N85-28241

COOPERATION
The effects of controversy and concurrence seeking on effective decision making
[AD-A153370] N85-28555

COORDINATES
When is a Bernstein-Bezier curve the graph of a function? N85-28568
Generation of surface coordinates by elliptic partial differential equations N85-28583
A survey of composite grid generation for general three-dimensional sections N85-28584
A discussion of adaptive grids and their applicability in numerical hydrodynamic modeling
[AD-A151843] N85-28659
Montonicity preserving bicubic interpolation, revision 1
[DE85-007976] N85-28683

COORDINATION
Photochemistry of coordination complexes: The phthalocyanines
[DE85-007693] N85-28022

COPOLYMERS
An investigation of molecular structure of copolymers using positron annihilation spectroscopy
[NASA-TM-86431] N85-27977
Thermally stable elastomers: Review of silarylene-siloxane polymers and polysilmethylenes
[AD-A152323] N85-28111

COPPER
The production of copper phthalocyanine and/or its derivatives
[NASA-TM-77629] N85-27983
The loss of material from the cathode of metal arcs
[NASA-TM-77845] N85-27985
Improving the properties of copper and copper alloys through heat treatment and alloying
[BLL-BISI-TRANS-21939-(9022.06)] N85-28047

COPPER ALLOYS
Improving the properties of copper and copper alloys through heat treatment and alloying
[BLL-BISI-TRANS-21939-(9022.06)] N85-28047

CORRELATION
Correlation of zeolite ZSM-5 acid strength with catalytic activity and selectivity
[DE85-005415] N85-28013
A bilaterally deterministic rho-mixing stationary random sequence
[AD-A152856] N85-28666

CORRELATION DETECTION
On the probability density of signal-to-noise ratio in an improved detector
[AD-A152529] N85-28232

CORROSION
Thermomechanical treatment aimed at the protection of type 316 stainless steel from IGC and IGSCC
[BLL-BISI-TRANS-22496-(9022.06)] N85-28040
Effect of the agressive action of soil on metallic pipelines. New possibilities for the passive and active corrosion protection
[BLL-BISI-TRANS-21630-(9022.06)] N85-28070
New method of calculating the economic effects of corrosion
[BLL-BISI-TRANS-22348-(9022.06)] N85-28079

Metallurgical means of preventing the corrosion of metal
[BLL-BISI-TRANS-22320-(9022.06)] N85-28082
Physical-chemical model for the mechanism of glass corrosion with particular consideration of simulated radioactive waste glasses
[DE85-007713] N85-28121
Exhaust systems for passenger vehicles: Test procedure for resistance to internal corrosion of silencers
[BLL-BISI-TRANS-22360-(9022.06)] N85-28361

CORROSION PREVENTION
Forming of coating protection system: Mechanism of paint-coating anti-corrosion protection of steel
[BLL-BISI-TRANS-22081-(9022.06)] N85-28033
Anticorrosion protection of reinforcing steel in prestressed gypsum and anhydrite concrete
[BLL-BISI-TRANS-22079-(9022.06)] N85-28044
Properties of chromate coatings formed on electrolytic zinc substrates
[BLL-BISI-TRANS-22349-(9022.06)] N85-28052
Effect of the agressive action of soil on metallic pipelines. New possibilities for the passive and active corrosion protection
[BLL-BISI-TRANS-21630-(9022.06)] N85-28070

CORROSION RESISTANCE
Properties of corrosion resistant stabilized ferritic steels
[BLL-BISI-TRANS-22519-(9022.06)] N85-28039
The corrosion resistance of chromium-nickel steel containing rare-earth metals
[BLL-BISI-TRANS-22477-(9022.06)] N85-28041
Anticorrosion protection of reinforcing steel in prestressed gypsum and anhydrite concrete
[BLL-BISI-TRANS-22079-(9022.06)] N85-28044
Properties of chromate coatings formed on electrolytic zinc substrates
[BLL-BISI-TRANS-22349-(9022.06)] N85-28052
New process for production of bimetal with corrosion-resistant cladding layer
[BLL-BISI-TRANS-22371-(9022.06)] N85-28056
Obtaining oxide films on surface of tubes of chromium-nickel steels
[BLL-BISI-TRANS-22478-(9022.06)] N85-28076
Dispersion-strengthened powder-metallurgical chromium steels
[BLL-BISI-TRANS-22323-(9022.06)] N85-28081
Metallurgical means of preventing the corrosion of metal
[BLL-BISI-TRANS-22320-(9022.06)] N85-28082
Properties of nitrogen containing stainless alloy designed for high resistance to pitting
[DE85-008262] N85-28095
Development of high temperature resistant, noncorroeible, non-metallic ceramic materials, especially silicon nitride in gas turbine application
[BMFT-FB-T-85-015] N85-28125
Development of high temperature resistant noncorrodible silicon carbide components for gas turbine applications, follow-up report
[BMFT-FB-T-85-016] N85-28126
Exhaust systems for passenger vehicles: Test procedure for resistance to internal corrosion of silencers
[BLL-BISI-TRANS-22360-(9022.06)] N85-28361
Proper quality of anticorrosion work no matter how bad the atmospheric conditions
[BLL-BISI-TRANS-22080-(9022.06)] N85-28383

CORROSION TESTS
Corrosion characteristics of some steels produced through a self-cleaning rotating electrode
[BLL-BISI-TRANS-22046-(9022.06)] N85-28034
Corrosion test on high-alloy steels
[BLL-BISI-TRANS-21627-(9022.06)] N85-28046
Exhaust systems for passenger vehicles: Test procedure for resistance to internal corrosion of silencers
[BLL-BISI-TRANS-22360-(9022.06)] N85-28361

COSMIC X RAYS
Observation of the Crab nebula in the hard X-ray
[MPE-186] N85-28897
Cosmic X-ray physics
[NASA-CR-175906] N85-28910

COST ANALYSIS
Logical design of a decision support system to forecast technology, prices and costs for the national communications system
[AD-A152330] N85-28198

COST EFFECTIVENESS
Plasma processing of materials
[AD-A152398] N85-28800

COST ESTIMATES
Airport and airway system cost allocation model. Volume 7: User's manual
[AD-A152877] N85-27917

COSTS
Flying in spite of the weather
[NLR-MP-84021-U] N85-27847

COULOMB POTENTIAL
Memory function for cyclotron resonance of two-dimensional electron systems
[AD-A152632] N85-28731
Spin distributions in heavy ion fusion at and below the Coulomb barrier
[DE85-007817] N85-28751

COUNTING
Counting is easy — Turing machines
[CWI-CS-R8423] N85-28606

COUPLED MODES
Techniques for operating Charge Coupled Devices (CCD's) in very high speed framing mode
[AD-A152878] N85-28238

COUPLING
Laser plasma LINAC
[DE85-008294] N85-28348

COUPLINGS
Vibrations of rotors connected through couplings with backlash N85-28147

COVARIANCE
Robust regression through robust covariances
[AD-A153301] N85-28677

CRAB NEBULA
Observation of the Crab nebula in the hard X-ray
[MPE-186] N85-28897

CRACK GEOMETRY
Measurement of fracture macro-geometry in evaluating fracture toughness
[BLL-BISI-TRANS-22241-(9022.06)] N85-28403

CRACK INITIATION
Engineering significance of fatigue thresholds and short fatigue cracks for structural design
[NLR-MP-84001-U] N85-28430
High temperature fracture mechanics of silicon nitride
[BMFT-FB-T-84-285] N85-28433
Method of assessment of start of slow crack growth by acoustic emission technique
[BLL-BISI-TRANS-21762-(9022.06)] N85-28722

CRACK PROPAGATION
USAF damage tolerant design handbook: Guidelines for the analysis and design of damage tolerant aircraft structures, revision B
[AD-A153161] N85-27858
The synergistic actions of stress corrosion cracking and corrosion fatigue
[BLL-BISI-TRANS-22334-(9022.06)] N85-28045
Study on mechanism of surface deformation induced by stress corrosion cracking
[BLL-BISI-TRANS-21896-(9022.06)] N85-28066
Overload effects on sustained load crack growth at elevated temperature
[AD-A153223] N85-28091
Hydrogen degradation of pipeline steels
[DE85-006930] N85-28101
Characterization of the fatigue and slow crack growth behavior of partially stabilized zirconia ceramics
[DE85-005240] N85-28113
Differential between crack and pseudo-crack indications by means of objective magnetic flux leakage testing
[BLL-BISI-TRANS-22033-(9022.06)] N85-28386
On validity of threshold values of fatigue strength of steel structures
[BLL-BISI-TRANS-22192-(9022.06)] N85-28408
The fatigue properties of welds at low temperature, according to the type of steel
[BLL-BISI-TRANS-22455-(9022.06)] N85-28410
Fatigue crack propagation characteristics and fatigue fracture toughness in 780 MPa grade high strength steel weldments at low temperature
[BLL-BISI-TRANS-22369-(9022.06)] N85-28411
Interaction among inhomogeneities and inclusions
[AD-A153114] N85-28419
Evaluation of interpolative modeling concepts for fatigue crack growth at elevated temperature
[AD-A153222] N85-28422
Method of assessment of start of slow crack growth by acoustic emission technique
[BLL-BISI-TRANS-21762-(9022.06)] N85-28722

CRACK TIPS
Detecting and analyzing crack defects
[BLL-BISI-TRANS-22062-(9022.06)] N85-28723
Ultrasonic crack tip method for the determination of crack depth N85-28725

CRACKING (FRACTURING)
Technical information: Weldability of stainless steel. Part 1: Austenitic stainless steel
[BLL-BISI-TRANS-22456-(9022.06)] N85-28362
On validity of threshold values of fatigue strength of steel structures
[BLL-BISI-TRANS-22192-(9022.06)] N85-28408
Interaction among inhomogeneities and inclusions
[AD-A153114] N85-28419
Detecting and analyzing crack defects
[BLL-BISI-TRANS-22062-(9022.06)] N85-28723
Echo-response from crack-like two-dimensional reflectors in focused ultrasonic fields N85-28724

CRACKS
Measurement of fracture macro-geometry in evaluating fracture toughness
[BLL-BISI-TRANS-22241-(9022.06)] N85-28403
On validity of threshold values of fatigue strength of steel structures
[BLL-BISI-TRANS-22192-(9022.06)] N85-28408

CRASHWORTHINESS
The Shock and Vibration Digest, volume 17, no. 2
[AD-A153129] N85-28400
Recent progress in the dynamic plastic behaviour of structures, part 4 N85-28402

CREATIVITY
Central problems in the management of innovation
[AD-A152598] N85-28852

CREEP BUCKLING
Dynamic creep buckling: Analysis of shell structures subjected to time-dependent mechanical and thermal loading N85-27959

CREEP PROPERTIES
Liquid-metal transducers for strain measurement during in-pile materials testing N85-28176
Influence of materials creep on rotor dynamics
[DE85-006545] N85-28426

CREEP RUPTURE STRENGTH
High-thermal-gradient superalloy crystal growth N85-27966
Experiments and micromechanical models for creep-rupture in polymer matrix composites
[DE85-009533] N85-28118
Fatigue behavior of synthetic fibers, yarns and ropes N85-28415

CREEP STRENGTH
Mechanical properties of polycrystalline alpa titanium
[BLL-BISI-TRANS-21923-(9022.06)] N85-28029

CRITICAL PATH METHOD
On stochastic integral representation of stable processes with sample paths in Banach spaces
[AD-A152927] N85-28703

CROSSLINKING
Polyaromatic ether-sulfone-keytones with fluoro-substituted-p-cyclophane units as cross-linking sites
[AD-D011649] N85-28105

CROSSTALK
Basic EMC technology advancement for C3 systems. Volume 4F: Prediction of crosstalk in flatpack coaxial cables
[AD-A153111] N85-28242

CRYOGENIC ROCKET PROPELLANTS
Assessment study of liquid content measurement methods applicable to space missions — Infrared Space Observatory
[TU-HH-TRI-ESA-84-2] N85-28135

CRYOGENICS
Research on design of cryotransformers and its prospects for the future
[AD-A152400] N85-28230
Experience with oepration of a large magnet system in the international fusion superconducting magnet test facility
[DE85-009258] N85-28721

CRYSTAL GROWTH
High-thermal-gradient superalloy crystal growth N85-27966
Research on the kinetics of phase changes in solids
[AD-A152367] N85-27989
Model for the growth of fractal silica polymers
[DE85-007884] N85-28115
Heat pipe and method of making same
[AD-D011654] N85-28273
InP materials
[AD-A152341] N85-28828
Telescoping low vibration pulling mechanism for Czochralski crystal growth
[AD-D011655] N85-28836
Rapid growth of potassium dihydrogen phosphate crystals
[DE85-007261] N85-28839
Morphology of GaAs/sub 1-x/P/sub x/ superlattices grown by MOCVD and chloride VPE
[DE85-002944] N85-28842

CRYSTAL OSCILLATORS
Cut angles for quartz crystal resonators
[AD-D011652] N85-28220
Acceleration insensitive oscillator
[AD-D011621] N85-28236
Proceedings of the Fifteenth Annual Precise Time and Time Interval (PTTI) Applications and Planning Meeting
[AD-A149163] N85-28287
A new precision time and frequency source for stationary PTTI applications N85-28297

A plan for the development of inertial reconstruction of initial state clock (IRIS) N85-28317
High performances from a new design of crystal oscillator N85-28318
Design of SC cut 10 MHZ H.Q. crystals with G. sensitivity better than 2.10(-10)/G N85-28319
Crystal resonator/oscillator test facility and test results N85-28322

CRYSTAL STRUCTURE
Effects of the cooling rate on the structure of the graphite in inoculated irons
[BLL-BISI-TRANS-22305-(9022.06)] N85-28083

CRYSTALLIZATION
Multi-phase crystallization of ferrous alloys
[BLL-BISI-TRANS-22441-(9022.06)] N85-28037
The synthesis and structure of polyphosphazenes
[AD-A153134] N85-28112
Microstructure-mechanical property relationships in transformation-toughened ceramics
[DE85-009722] N85-28117

CRYSTALLOGRAPHY
X-ray crystallography of steel U8 after pulsed laser hardening
[BLL-BISI-22444-(9022.06)] N85-28038

CRYSTALS
Ac field-induced order in dense colloidal systems
[DE85-009107] N85-28119
Central limit theorems in the area of large deviations for some dependent random variables
[AD-A153125] N85-28831

CURRENT ALGEBRA
Modern test of chiral anomalies
[DE85-005892] N85-28680

CURVATURE
Examination of the circle spline routine N85-28573
Convex interpolating splines of arbitrary degree N85-28574

CURVES (GEOMETRY)
Shape preserving spline interpolation N85-28564
The construction of curves and surfaces using numerical optimization techniques N85-28565
A survey of patch methods N85-28567
When is a Bernstein-Bezier curve the graph of a function? N85-28568
Boundary to constructive solid geometry mapings: A focus on 2-D issues N85-28570
The definition and computation of a metric on plane curves. The meaning of a face on a geometric model N85-28571
A natural bias approach to cardinal spline curves N85-28575
Adapting shape parameters for cubic Bezier curves N85-28576
A uniform subdivision method for triangular Bezier patches N85-28578
An intuitive approach to geometric continuity for parametric curves and surfaces (extended abstract) N85-28579
Spline curves, wire frames and B-value N85-28587
Numerical estimation of the curvature of biological surfaces N85-28588
Curved finite elements and curve approximation N85-28590
Comparison of two algebraic methods for curve/curve intersection N85-28591
A comparison of three curve intersection algorithms N85-28592

CUTTERS
Removal of longitudinal internal flash from electrically welded tubes
[BLL-BISI-TRANS-22360-(9022.06)] N85-28136

CYCLIC ACCELERATORS
Stability in dynamical systems
[DE85-006698] N85-28766

CYCLIC COMPOUNDS
Polyaromatic ether-sulfone-keytones with fluoro-substituted-p-cyclophane units as cross-linking sites
[AD-D011649] N85-28105

CYCLIC LOADS
Structural tailoring of SSME blades (vanes) N85-27960
Interaction of high-cycle and low-cycle fatigue of Haynes 188 alloy at 1400 F deg N85-27961
Effects of high mean stress on high-cycle fatigue behavior of PWA 1480 N85-27964
Constitutive cyclic deformation behavior in single-crystal and directionally solidified SSME high-pressure fuel turbopump airfoil materials N85-27965
Fatigue behavior of synthetic fibers, yarns and ropes N85-28415

CYCLONES
Kinetic energy and vorticity of lee cyclones
[MITT-40] N85-28502
Characteristics of North Indian Ocean tropical cyclone activity
[AD-A153085] N85-28524

CYCLOTRON RESONANCE
Memory function for cyclotron resonance of two-dimensional electron systems
[AD-A152632] N85-28731

CYCLOTRON RESONANCE DEVICES
Design and testing of a high power quasi-optical gyrotron
[AD-A153212] N85-28330
The design of megawatt gyrotrons
[DE85-007892] N85-28754

CYLINDRICAL BODIES
Buildup of oscillation of bodies in stratified fluid N85-28157
Effects of the corona wind on the cooling of a horizontal cylinder
[AD-A153101] N85-28241

CYLINDRICAL SHELLS
Stability of cylindrical shells with variable thickness under external pressure N85-28164
Scattering of sounds by piezoceramic cylindrical shell near rigid surface N85-28168

CYLINDRICAL TANKS
SRB filament wound case material property study
[NASA-CR-171469] N85-27940
Local heat treatment of welded joints of pipes and rotary vessels N85-28028

CYLINDRICAL WAVES
Propagation of non-axisymmetric elastic waves through shell with filler under radial load at one end N85-28169

CZOCHRALSKI METHOD
InP materials
[AD-A152341] N85-28828
Telescoping low vibration pulling mechanism for Czochralski crystal growth
[AD-D011655] N85-28836

D

DAMAGE
Reexamination of cumulative fatigue damage laws N85-27962

DAMAGE ASSESSMENT
USAF damage tolerant design handbook: Guidelines for the analysis and design of damage tolerant aircraft structures, revision B
[AD-A153161] N85-27858

DAMPING
Influence of materials creep on rotor dynamics
[DE85-008545] N85-28426

DATA ACQUISITION
Data processing on the rotor test stand at DFVLR in Brunswick: Microprogrammable interfaces and array processor as key components in a PDP 11 real time data acquisition and processing system
[DFVLR-MITT-85-03] N85-27921
Automation of Precise Time Reference Stations (PTRS) N85-28291
US Naval Observatory collection and utilization of time comparison data N85-28292
Laser measurement techniques: Laser spectroscopy in semiconductors
[DE85-007887] N85-28350
DOE/ANL/HTRI heat exchanger tube vibration data bank: Addendum 5
[DE85-007730] N85-28425
Microcomputer-controlled system for measuring atmospheric particle fluxes
[DE85-007910] N85-28469
Centralized Storm Information System (CSIS)
[NASA-CR-175898] N85-28506
Test and evaluation plan for the Centralized Storm Information System N85-28508
CSIS test and evaluation N85-28509
Functional and performance requirements of the next NOAA-Kasas City computer system N85-28510

DATA BASE MANAGEMENT SYSTEMS
Defense data network support concept analysis
[AD-A153214] N85-28649
Complete development and implement AFIT/ENG database management system, volume 1
[AD-A153043] N85-28866
DLA: Data/data base administration analysis
[AD-A153031] N85-28879

DATA BASES
Evaluation of Defense Mapping Agency level 1 second edition digital data for training simulator applications
[AD-A152444] N85-28437
Chemicals identified in human biological media, a data base, volume 6, part 1
[DE85-008768] N85-28542
A test methodology for an automated and interactive software development environment
[AD-A152857] N85-28618
Distributed systems management in wide area networks
[CWI-CS-R8419] N85-28651
Experimental philosophy leading to a small scale digital data base of the conterminous United States for designing experiments with remotely sensed data
[NASA-TM-85009] N85-28877
A study of user-defined searching requirements for the on-line version of the directory of DOD-sponsored R and D data bases on the Defense Gateway computer system
[AD-A153000] N85-28878
Energy data base: Subject categories and scope
[DE84-017376] N85-28881

DATA COMPRESSION
Alphabet-constrained data compression
[AD-A152887] N85-28667

DATA PROCESSING
A study of error rates in voice recognition
[AD-A153282] N85-28211
Restructurable VLSI (Very large scale integration) program
[AD-A152340] N85-28226
Developments in remote sensing
[B8580089] N85-28441
A comparison of numeric data entry with touch-sensitive and conventional numeric keypads
[AD-A153276] N85-28598
Computing environments for data analysis. Part 1: Introduction
[DE85-007919] N85-28603
Computing environments for data analysis. Part 2: Hardware
[DE85-008320] N85-28604
Interfacing the VAX 11/780 using Berkeley Unix 4.2.BSD and Ethernet based Xerox network systems, volume 1
[AD-A152953] N85-28645
Estimating random integrals from noisy observations: Sampling designs and their performance
[AD-A152926] N85-28702
Complete development and implement AFIT/ENG database management system, volume 1
[AD-A153043] N85-28866

DATA PROCESSING EQUIPMENT
The touch panel system: Design and development
[AD-A153014] N85-28596
A study of user-defined searching requirements for the on-line version of the directory of DOD-sponsored R and D data bases on the Defense Gateway computer system
[AD-A153000] N85-28878

DATA REDUCTION
Digital filters for application to data analysis in electron energy loss spectroscopy
[DE85-007932] N85-28020
US Naval Observatory collection and utilization of time comparison data N85-28292
Heating parameter estimation using coaxial thermocouple gages in wind tunnel test articles
[AD-A153039] N85-28328

DATA STORAGE
Study of raster metafile formats
[AD-A153322] N85-28624

DATA SYSTEMS
US Naval Observatory collection and utilization of time comparison data N85-28292
A comparison of numeric data entry with touch-sensitive and conventional numeric keypads
[AD-A153276] N85-28598
The IRAS end-to-end data system
[NLR-MP-83056-U] N85-28883

DATA TRANSMISSION
Rational pulse-shaping filters for almost MSK-like modulation
[AD-A153065] N85-28208
Automation of Precise Time Reference Stations (PTRS) N85-28291
UHF IRIG G distribution system N85-28308
A new technique for system-to-system transfer of surface data N85-28589
Interfacing the VAX 11/780 using berkeley UNIX 4.2BSD and Ethernet based Xerox Network Systems
[AD-A153174] N85-28647
Torus data flow for parallel computation of missized matrix problems
[DE85-008761] N85-28715

DECISION MAKING
Logical design of a decision support system to forecast technology, prices and costs for the national communications system
[AD-A152330] N85-28196
The effects of controversy and concurrence seeking on effective decision making
[AD-A153370] N85-28555

The interface with decision makers in interactive multiobjective linear programming [REPT-84-38] N85-28637
On estimating transition intensities of a Markov process with aggregate data of a certain type [CWI-MS-R8411] N85-28707
Multicriteria decision analysis as an aid to strategic planning of energy research and development [REPT-84-02] N85-28870

DECODERS
A software simulation study of a (255,223) Reed-Solomon encoder-decoder [NASA-CR-175872] N85-28192

DECOMPOSITION
The decomposition of gas phase formaldehyde by plasma discharge [AD-A153202] N85-28007
Methanol adsorption on Pt(111) [DE85-006802] N85-28017
Powder-metallurgy alloys and steels [BLL-BISI-TRANS-22239-(9022.06)] N85-28050

DEEP SPACE NETWORK
Performance analysis of the DSN baseband assembly (Bba) Real-Time Combiner (RTC) [NASA-CR-175878] N85-28190
Performance analysis of the DSN baseband assembly (Bba) Real-Time Combiner (RTC) [NASA-CR-175877] N85-28193

DEFECTS
Interaction among inhomogeneities and inclusions [AD-A153114] N85-28419

DEFENSE PROGRAM
Defense data network support concept analysis [AD-A153214] N85-28649
The Department of Defense statement on the Science and Technology Program by Colonel Donald I. Carter, USAF Acting Deputy Under Secretary of Defense for Research and Advanced Technology before the Subcommittee on Research and Development of the Committee on Armed Services of the United States House of Representatives, 99th Congress, first session [AD-A152467] N85-28850
Rome Development Center Air Force technical objective document C3I FY-86 [AD-A152476] N85-28851
The revolution in military affairs and the Soviet system [AD-P004568] N85-28863

DEFORMATION
Constitutive cyclic deformation behavior in single-crystal and directionally solidified SSME high-pressure fuel turbopump airfoil materials N85-27965
Preparation of metal for cold upsetting [BLL-BISI-TRANS-22383-(9022.06)] N85-28043
Study on mechanism of surface deformation induced by stress corrosion cracking [BLL-BISI-TRANS-21896-(9022.06)] N85-28066
Temperature and manganese content dependences of tensile deformation in iron-high manganese binary alloys [DE85-007656] N85-28098
Investigations of the material factors in the adiabatic shearing of steels [AD-A153084] N85-28418

DEGREES OF FREEDOM
Electroweak interactions in nuclei [DE85-007811] N85-28762

DELTA FUNCTION
Wake fields and wake field acceleration [DE85-006054] N85-28750

DEMOGRAPHY
An empirical comparison of the accuracy of univariate and multivariate corrections for range restriction [AD-A153071] N85-28670
On estimating transition intensities of a Markov process with aggregate data of a certain type [CWI-MS-R8411] N85-28707

DENDRITIC CRYSTALS
Role of hydrogen and structure on CMSX-2 N85-27967

DENSE PLASMAS
Restrike particle beam experiments on a dense plasma focus. Opening switch research on a dense plasma focus [AD-A152991] N85-28802

DENSITY DISTRIBUTION
The transport of neutral H, D, T and He and O in the boundary layers of a Tokamak plasma [REPT-84-153] N85-28817

DEPENDENT VARIABLES
Development factors and field dependence-independence [AD-A152337] N85-28545

DEPLOYMENT
Deployable controllable geometry truss beam [NASA-TM-86366] N85-27934
Solar array flight experiment [NASA-TM-86506] N85-27935

DEPOSITION
Jet fuel instability mechanisms [NASA-CR-175856] N85-28127
Heat pipe and method of making same [AD-D011654] N85-28273

DEPTH
The effect of ion-bombardment-induced atomic mixing on depth-profiling of interfaces [AD-A153199] N85-28834

DEPTH MEASUREMENT
An assessment of the potential role of multispectral imagery in bathymetric charting [AD-A152460] N85-28438
Detecting and analyzing crack defects [BLL-BISI-TRANS-22062-(9022.06)] N85-28723
Ultrasonic crack tip method for the determination of crack depth N85-28725

DESCENT PROPULSION SYSTEMS
Descent vehicles [NASA-TM-77654] N85-27933

DESCENT TRAJECTORIES
Descent vehicles [NASA-TM-77654] N85-27933

DESCRIPTIONS
Systematic nomenclature of the nitrogen, oxygen and sulfur functional polycyclic aromatic hydrocarbons [DE85-007426] N85-27974

DESERTS
Quality assurance for RESOLVE (Research on Operations-Limiting Visual Extinction). A visibility study in the California desert [AD-A152383] N85-28494

DESICCANTS
Experiments on sorption characteristics of solid desiccant materials for solar desiccant cooling systems [DE85-000542] N85-28019

DESIGN ANALYSIS
Radiometer integrated into a communication terminal [AD-A151746] N85-28195
SC filters and design centering of integrated circuits. Part 2: Design centering of integrated circuits [BMFT-FB-T-84-265-PT-2] N85-28257
A ten channel temperature controller [AD-A152664] N85-28326
Design and construction of a CW ND:YAG laser using a single elliptical cavity and water cooled krypton arc lamp pumping [AD-A152657] N85-28340
Resonator optical designs for free electron lasers [DE85-007678] N85-28347
Silica problem in the design of geothermal power plants [DE85-008245] N85-28453
Peer Review of a Formal Verification/Design Proof Methodology [NASA-CP-2377] N85-28609
Optimum dimensions of power solenoids for magnetic suspension [NASA-TM-77664] N85-28716
Impurity control and vacuum pumping system design and analysis for next-generation Tokamaks [DE85-009291] N85-28815

DESORPTION
The development of laser analytical methods for the characterization of solid-liquid and solid-high pressure gas interfaces [AD-A152382] N85-27988
Theory of laser-stimulated surface process. 2: A generalized-master-equation approach to energy transfer between an IR laser, an aspecties and phonons [AD-A153083] N85-28344

DESTRUCTION
Interaction among inhomogeneities and inclusions [AD-A153114] N85-28419

DESTRUCTIVE TESTS
Qualitative and quantitative determination of aging by mechanical tests --- plastics N85-28393

DETECTION
Optimally robust redundancy relations for failure in uncertain systems [NASA-CR-175953] N85-28391
Automatic detection of gust fronts [FAA/PM-85-11] N85-28516

DEUTERIUM
Possible indication of an A-dependence of R in deep-inelastic electron scattering from nuclei [DE85-008174] N85-28783

DEUTERONS
Cluster production and entropy [DE85-007626] N85-28752

DF LASERS
Operating characteristics, absorptivity/reflectivity measurements, and pulse system design of the NPS (Naval Postgraduate School) hydrogen fluoride/deuterium fluoride laser [AD-A152712] N85-28341

DIELECTRIC PROPERTIES
Design of the waveguide for microwave heating of solid lithium ceramic blankets [DE85-009776] N85-28120

DIELECTRICS
Completely consumed carbide: A new process for dielectric isolation [AD-A152379] N85-27987
Self-scanning MDS-integrated photosensor strip N85-28151
Analysis of time dependent dielectric failures [AD-A153200] N85-28243
Experimental approaches to the measurement of dielectronic recombination [DE85-006627] N85-28743

DIES
Precision die forging of blades or gas turbines N85-28148

DIESEL ENGINES
Clean-burning diesel engines [AD-A152606] N85-28374
Future of ceramic turbochargers: Promises and pitfalls [DE85-006209] N85-28380

DIESEL FUELS
Catalyst and reactor development for a liquid phase Fischer-Tropsch process [DE85-005894] N85-28014

DIFFERENCE EQUATIONS
Upwind-difference methods for aerodynamic problems governed by the Euler equations [REPT-84-23] N85-27834

DIFFERENTIAL AMPLIFIERS
High temperature position sensors based on monolithic GaAs Hall IC [BMFT-FB-T-84-266] N85-28337

DIFFERENTIAL EQUATIONS
Projected discrete ordinates methods for numerical transport problems [DE85-005632] N85-28678
Spatial differencing for finite difference codes [DE85-008902] N85-28684
Dynamical systems and numerical integration [CWI-AM-R8413] N85-28695
Symmetric linear multistep methods for second-order differential equations with periodic solutions [CWI-NM-R8501] N85-28696

DIFFERENTIAL INTERFEROMETRY
Measurement of ultrasonic fields in transparent media using a scanning differential interferometer [NASA-CR-175921] N85-28726

DIFFRACTION
Experimental studies of diffractive phenomena [DE85-006812] N85-28749

DIFFUSION
The development of laser analytical methods for the characterization of solid-liquid and solid-high pressure gas interfaces [AD-A152382] N85-27988
Use of principle of local equilibrium for assessing diffusional supersaturation during solidification of alloys [BLL-BISI-TRANS-22487-(9022.06)] N85-28077
Metallurgical means of preventing the corrosion of metal [BLL-BISI-TRANS-22320-(9022.06)] N85-28082
The effect of ion-bombardment-induced atomic mixing on depth-profiling of interfaces [AD-A153199] N85-28834

DIFFUSION COEFFICIENT
Transport in aqueous battery systems [DE85-007246] N85-28251

DIFFUSION THEORY
Projected discrete ordinates methods for numerical transport problems [DE85-005632] N85-28678
Augmented weighted diamond force of the linear nodal scheme for Cartesian coordinate systems [DE85-005631] N85-28679
Nonlinear problems in continuum mechanics [AD-A153387] N85-28848

DIGITAL COMMAND SYSTEMS
Application of AFTI/F-16 task-tailored control modes in advanced multirole fighters N85-27888
X-29 digital flight control system design N85-27889
Some flight test results with redundant digital flight control systems N85-27892

DIGITAL COMPUTERS
An update of experience on the fly by wire Jaguar equipped with a full-time digital flight control system N85-27893
Operational and developmental experience with the F/A-18A digital flight control system N85-27895
Flight testing and development of the F/A-18A digital flight control system N85-27896
Language design, computers and brains [AD-A152819] N85-28594

DIGITAL DATA
Evaluation of Defense Mapping Agency level 1 second edition digital data for training simulator applications
[AD-A152444] N85-28437
Experimental philosophy leading to a small scale digital data base of the conterminous United States for designing experiments with remotely sensed data
[NASA-TM-85009] N85-28877

DIGITAL FILTERS
Digital filters for application to data analysis in electron energy loss spectroscopy
[DE85-007932] N85-28020

DIGITAL SYSTEMS
Certifying complex digital systems on civil aviation aircraft N85-27907
The design of an adaptive predictive coder using a single-chip digital signal processor
[AD-A152461] N85-28231
Evaluation of Defense Mapping Agency level 1 second edition digital data for training simulator applications
[AD-A152444] N85-28437
Further study of digital matching of dissimilar images
[AD-A153112] N85-28672

DIGITAL TECHNIQUES
Digital methods of the optimum processing of radar signals
[AD-A152469] N85-28202

DILUENTS
New air-curing lacquer systems with high solids content
[BMFT-FB-T-85-005] N85-28124

DIMENSIONLESS NUMBERS
Ohmic potential drop and gas bubble radius distribution in alkaline water electrolysis N85-28025

DIMERS
Investigation of the structure and dynamics of electrolytes in solvents used for primary and secondary Li-batteries
[AD-A153099] N85-28240

DIPOLE MOMENTS
Electroweak interactions in nuclei
[DE85-007811] N85-28762

DIRECT CURRENT
Performance analysis of radiation cooled dc transmission lines for high power space systems
[NASA-TM-87040] N85-28222

DIRECTIONAL CONTROL
Controller requirements for uncoupled aircraft motion, volume 1
[AD-A153173] N85-27878

DIRECTORIES
A study of user-defined searching requirements for the on-line version of the directory of DOD-sponsored R and D data bases on the Defense Gateway computer system
[AD-A153000] N85-28878

DISCRETE FUNCTIONS
Discrete mathematics for communications systems
[AD-A152814] N85-28664

DISKS (SHAPES)
The definition and computation of a metric on plane curves. The meaning of a face on a geometric model N85-28571

DISPENSERS
Continued development and testing of tungsten controlled porosity dispenser cathodes
[AD-A152595] N85-28090

DISPLAY DEVICES
Centralized Storm Information System (CSIS)
[NASA-CR-175898] N85-28506
A report from the Space Science and Engineering Center, the University of Wisconsin-Madison, Madison, Wisconsin N85-28507
CSIS test and evaluation N85-28509
Generation and display apparatus
[AD-D011639] N85-28599
Study of raster metafile formats
[AD-A153322] N85-28624
Spatial light modulator having a capacitively coupled photoconductor
[AD-D011646] N85-28790

DISSOCIATION
Experimental study of dissociative attachment in optically-pumped lithium molecules
[AD-A152800] N85-28738
Experimental studies of diffractive phenomena
[DE85-006812] N85-28749

DISTANCE
Laser measurements of distances from the ORELA neutron target to experiment stations along flight paths 1 and 6
[DE85-009457] N85-28352

DISTANCE MEASURING EQUIPMENT
Distance Measuring Equipment (DME), general
[AD-A152565] N85-27846

DISTRIBUTED PROCESSING
Real-Time Multiprocessor Programming Language (RTMPL) user's manual
[NASA-TP-2422] N85-28610
Automatic distribution of programs in MASCOT and Ada (trademark) environments: A feasibility study
[AD-A152665] N85-28614
Investigation and implementation of a tree transformation system for user friendly programming
[AD-A152716] N85-28617
CLEANROOM software development: An empirical evaluation
[AD-A152924] N85-28619
System Analysis for the Huntsville Operation Support Center, Distributed Computer System
[NASA-CR-171506] N85-28642
A real-time executive for multiple-computer clusters
[AD-A152961] N85-28646
Multicomputer operating systems and applications
[AD-A153205] N85-28648
The design of a capability-based distributed operating system
[CWI-CS-R8418] N85-28650
Distributed systems management in wide area networks
[CWI-CS-R8419] N85-28651
Distributed matchmaking for processes in computer networks
[CWI-CS-R8421] N85-28652
Distributed elections in a ring of processors using Archimedean time
[CWI-CS-R8416] N85-28653

DISTRIBUTION FUNCTIONS
Nonsmooth analysis and Frechet differentiability of M-functionals
[AD-A152932] N85-28668

DIURNAL VARIATIONS
Precipitation and snow cover data, 1977
[ISBN-951-697-215-2] N85-28514

DO-28 AIRCRAFT
Identification of gust input and gust response characteristics from Do 28 TNT flight test data
[DFVLR-FB-84-48] N85-27881

DOCUMENTATION
A modern control theory enhancement to an Interactive Control Engineering Computer Analysis Package (ICECAP)
[AD-A153249] N85-28622
Bibliography of Lewis Research Center technical publications announced in 1984
[NASA-TM-87012] N85-28876

DOPED CRYSTALS
GaAs MESFET with lateral non-uniform doping N85-28827

DOPPLER RADAR
Weather radar studies
[AD-A152563] N85-28521

DOSIMETERS
Results from radiation monitoring equipment experiment on STS-11
[AD-A152531] N85-27932
Energy and Technology Review
[DE85-004358] N85-28868
Results from radiation monitoring equipment experiment on STS-8
[AD-A153241] N85-28911

DOWNLINKING
The IRAS end-to-end data system
[NLR-MP-83056-U] N85-28883

DRAG REDUCTION
Numerical study of porous airfoils in transonic flow
[NASA-TM-86713] N85-27828

DRIFT (INSTRUMENTATION)
Measurements of laser gyro errors as a function of the beam path
[DFVLR-FB-85-02] N85-28336
Technology development for thin-film-trace humidity sensors
[BMFT-FB-T-84-268] N85-28338

DRUGS
Progress, goals in biotechnology summarized N85-28182
Chemicals identified in human biological media, a data base, volume 6, part 1
[DE85-006768] N85-28542

DRYING
New air-curing lacquer systems with high solids content
[BMFT-FB-T-85-005] N85-28124

DUALITY THEOREM
The role of duality in optimization problems involving entropy functionals, with applications to information the ry
[AD-A152336] N85-28713

DUCTILITY
High-strength weldable steel 03G4N2MAF Sh with improved ductility
[BLL-BISI-TRANS-22233-(9022.06)] N85-28031
Preparation of metal for cold upsetting
[BLL-BISI-TRANS-22383-(9022.06)] N85-28043
Assessing the machinability of gearwheel steels during manufacture
[BLL-BISI-TRANS-22343-(9902.06)] N85-28365

DYES
The production of copper phthalocyanine and/or its derivatives
[NASA-TM-77629] N85-27983

DYNAMIC LOADS
An assessment of the suitability of the BHGA structural test rig for aerodynamic testing of hang gliders
[CA-8505] N85-27853
Critical conditions for failure in materials subjected to high rates of loading
[AD-A153135] N85-28420

DYNAMIC RESPONSE
Controller requirements for uncoupled aircraft motion, volume 1
[AD-A153173] N85-27878

DYNAMIC STABILITY
Solar array flight experiment
[NASA-TM-86506] N85-27935

DYNAMIC STRUCTURAL ANALYSIS
Overview of structural response: Probabilistic structural analysis N85-27952
Probabilistic finite element development N85-27956
Dynamic creep buckling: Analysis of shell structures subjected to time-dependent mechanical and thermal loading N85-27959

DYNAMICAL SYSTEMS
The dynamical behavior of the age-size-distribution of a cell population
[CWI-AM-R8414] N85-28538
Dynamical systems and numerical integration
[CWI-AM-R8413] N85-28695
Stability in dynamical systems
[DE85-006698] N85-28766

E

EARTH (PLANET)
Moon bounce communications to small terminals
[AD-A153297] N85-28212

EARTH ATMOSPHERE
The role of thermal motions of air particles for fireballs
[PUBL-59] N85-28900

EARTH CRUST
Proceedings of the 1980 Workshop of the International Association of Seismology and Physics of the Earth's Interior on the Seismic Modeling of Laterally Varying Structures: Contributions based on data from the 1978 Saudi Arabian refraction profile
[GS-CIRC-937] N85-28476
A crustal section for the Arabian Shield and adjacent Red Sea margin derived from first-arrival data N85-28480
The rifted margin of Saudi Arabia N85-28483

EARTH MANTLE
Proceedings of the 1980 Workshop of the International Association of Seismology and Physics of the Earth's Interior on the Seismic Modeling of Laterally Varying Structures: Contributions based on data from the 1978 Saudi Arabian refraction profile
[GS-CIRC-937] N85-28476

EARTH MOVEMENTS
The effects of seismic waves N85-28401

EARTH OBSERVATIONS (FROM SPACE)
Experimental philosophy leading to a small scale digital data base of the conterminous United States for designing experiments with remotely sensed data
[NASA-TM-85009] N85-28877

EARTH ORBITS
Maximizing the semi-major axis for a freely coning solar sailcraft
[AD-A153175] N85-27938

EARTH RADIATION BUDGET EXPERIMENT
Solar radiance models for determination of ERBE scanner filter factor
[NASA-CR-172595] N85-28513

EARTH RESOURCES
Thermal Infrared Multispectral Scanner (TIMS): An investigator's guide to TIMS data
[NASA-CR-175875] N85-28286
Yearbook of the Bureau of Mineral Resources, Geology and Physics: Geoscientific research, resource assessment, and database development, 1 Jul. 1983 to 30 Jun. 1984
[BMR-84] N85-28474

EARTH SURFACE
Preliminary interpretation of Saudi Arabian seismic refraction data N85-28477
EARTH TERMINALS
Moon bounce communications to small terminals [AD-A153297] N85-28212
EARTHQUAKES
The Shock and Vibration Digest, volume 17, no. 2 [AD-A153129] N85-28400
The effects of seismic waves N85-28401
Australian seismological report, 1980 [REPT-252] N85-28473
ECHO SOUNDING
Acoustooptic pulse-echo transducer system [NASA-CR-175919] N85-28224
ECOLOGY
ELF (Extremely Low Frequency) communications system ecological monitoring program: Measurements of ELF electromagnetic fields for site selection and characterization, 1983 [AD-A153120] N85-28209
ECONOMIC ANALYSIS
New method of calculating the economic effects of corrosion [BLL-BISI-TRANS-22348-(9022.06)] N85-28079
An analysis of the economic impact of the AN/APS-134 FLAR (Forward Looking Airborne Radar) retrofit on Coast Guard HC-130 aircraft [AD-A152619] N85-28204
Technology and technical efficiency in the Soviet Union: Dominant patterns of constrained optimization in a noncompetitive economic regime [AD-P004567] N85-28862
ECONOMIC IMPACT
New method of calculating the economic effects of corrosion [BLL-BISI-TRANS-22348-(9022.06)] N85-28079
An analysis of the economic impact of the AN/APS-134 FLAR (Forward Looking Airborne Radar) retrofit on Coast Guard HC-130 aircraft [AD-A152619] N85-28204
ECONOMICS
USSR report: Machine tools and metalworking equipment [JPRS-UMM-84-014] N85-28188
ECONOMY
Computing in the Soviet general economy: An introductory overview [AD-P004563] N85-28858
ECOSYSTEMS
ELF (Extremely Low Frequency) communications system ecological monitoring program: Measurements of ELF electromagnetic fields for site selection and characterization, 1983 [AD-A153120] N85-28209
Fatty and aromatic acid catabolizing bacteria from methanogenic ecosystems [DE85-008133] N85-28537
EDDY VISCOSITY
SSME fuel preburner two-dimensional analysis N85-27943
SSME turbopump turbine computations N85-27944
EDGES
Chemical applications of topology and group theory. 17: An information theoretical approach to polyhedral symmetry [AD-A152821] N85-27995
EDUCATION
The impact of group processing on achievement in cooperative learning groups [AD-A153168] N85-28551
Oral discussion, group-to-individual transfer and achievement in cooperative learning groups [AD-A153209] N85-28552
Summer High School Apprenticeship Research Program (SHARP) of the National Aeronautics and Space Administration [NASA-CR-175791] N85-28849
EFFECTS
The effects of controversy and concurrence seeking on effective decision making [AD-A153370] N85-28555
EFFICIENCY
Flow characteristics of a partially submerged liquid pickup [DE85-008744] N85-28276
EIGENVALUES
Incorporating control into the optimal structural design of large flexible space structures [AD-A152858] N85-27937
Solution to eigenvalue problems of antisymmetric cross-ply and antisymmetric angle-ply laminated plates using affine transformations [AD-A153040] N85-27980
Continuum modeling of latticed structures N85-28399
ELASTIC DEFORMATION
Influence of preliminary cold deformation on fineness of pearlite [BLL-BISI-TRANS-22409-(9022.06)] N85-28054
ELASTIC MEDIA
Numerical evaluation of low frequency sound propagation in layered media [AD-A152690] N85-28726
ELASTIC PROPERTIES
Numerical solution of one-dimensional nonlinear problems of statics for elastic beams and shells under rigid constraints N85-28166
Electronically excited alkaline earth oxides: Chemical production and collisional energy transfer processes [AD-A153172] N85-28833
ELASTIC SCATTERING
Stefan-Maxwell relations for plasma diffusion currents in magnetic field N85-28160
Experimental studies of diffractive phenomena [DE85-006812] N85-28749
ELASTIC SHELLS
Elastic equilibrium of composite shells with finite shear rigidity N85-28163
Numerical solution of one-dimensional nonlinear problems of statics for elastic beams and shells under rigid constraints N85-28166
Scattering of sounds by piezoceramic cylindrical shell near rigid surface N85-28168
ELASTIC WAVES
Propagation of non-axisymmetric elastic waves through shell with filler under radial load at one end N85-28169
ELASTOMERS
Thermally stable elastomers: Review of silarylene-siloxane polymers and polysilmethylenes [AD-A152323] N85-28111
ELASTOSTATICS
Numerical solution of one-dimensional nonlinear problems of statics for elastic beams and shells under rigid constraints N85-28166
ELECTRETS
Investigation of charge transport in the thermoelectret state of some ceramics and glasses [DE85-009318] N85-28122
ELECTRIC ARCS
Study of a constricted electric arc cooled by transpiration [NASA-TM-77846] N85-28798
Examination of a method for predicting the properties of railgun plasmas [AR-004-322] N85-28799
ELECTRIC AUTOMOBILES
Advanced vehicle systems assessment. Volume 1: Executive summary [NASA-CR-175876] N85-28887
ELECTRIC BATTERIES
Investigation of the structure and dynamics of electrolytes in solvents used for primary and secondary Li-batteries [AD-A153099] N85-28240
Aluminum-air power cell research and development [DE85-008117] N85-28456
ELECTRIC CHARGE
Investigation of charge transport in the thermoelectret state of some ceramics and glasses [DE85-009318] N85-28122
ELECTRIC CONDUCTORS
Heat resistant sheathed insulated electrical conductors [AD-D011644] N85-28219
ELECTRIC CONNECTORS
Derated application of parts for (Electronic Systems Division) systems development. Revision [AD-A153299] N85-28246
ELECTRIC CONTACTS
Comprehensive silicon solar cell computer modeling [NASA-CR-175959] N85-28461
ELECTRIC CORONA
Effects of the corona wind on the cooling of a horizontal cylinder [AD-A153101] N85-28241
ELECTRIC DIPOLES
Ac field-induced order in dense colloidal systems [DE85-009107] N85-28119
ELECTRIC DISCHARGES
Electrode for flash discharge lamps [DE85-006896] N85-28252
ELECTRIC EQUIPMENT
The touch panel system: Design and development [AD-A153014] N85-28596
ELECTRIC FIELDS
Ac field-induced order in dense colloidal systems [DE85-009107] N85-28119
Dependence of characteristics of centrifugal magnetohydrodynamic conduction pump on electrical conductance of end walls. Part 1: Experiment N85-28146
Electromagnetic transmission through a slot in a perfectly conducting plane [AD-A153224] N85-28210
Laser plasma LINAC [DE85-008294] N85-28348
Wake fields and wake field acceleration [DE85-008054] N85-28750
ELECTRIC GENERATORS
Test flight of IL-76TD long-range transport variant N85-27842
Principles of designing digital compensating accelerometers N85-28172
Activity and accomplishments of dish/Stirling electric power system development [NASA-CR-175841] N85-28445
ELECTRIC HYBRID VEHICLES
Advanced vehicle systems assessment. Volume 1: Executive summary [NASA-CR-175876] N85-28887
Urban vehicle research project [DE85-005444] N85-28889
ELECTRIC MOTOR VEHICLES
Test and evaluation of the Hoppecke Model E240G144/16 electric vehicle battery charger [DE85-900573] N85-28253
Test plan for acceptance, verification and performance testing of the Bedford Lucas Chloride Electric Van. Part 1: Acceptance and verification testing at EG and G Automotive Research. Part 2: INEL performance testing, revision 1 [DE85-005157] N85-28888
ELECTRIC NETWORKS
Numerical methods for stiff ordinary and elliptic partial differential equations [AD-A153247] N85-28675
ELECTRIC POTENTIAL
Streak tube characterization [DE85-009874] N85-28255
ELECTRIC POWER PLANTS
Tribological sinks: Money down the drain [DE85-010019] N85-28376
A program for the calculation of parsboloidal-dish solar thermal power plant performance [NASA-CR-175874] N85-28449
Silica problem in the design of geothermal power plants [DE85-008245] N85-28453
ELECTRIC POWER SUPPLIES
Large scale electricity production scheduling via nonlinear optimization [REPT-84-07] N85-28655
ELECTRIC PROPULSION
Primary propulsion of electrothermal, ion and chemical systems for space-based radar orbit transfer [NASA-TM-87043] N85-27972
ELECTRIC WELDING
Removal of longitudinal internal flash from electrically welded tubes [BLL-BISI-TRANS-22360-(9022.06)] N85-28136
Production of thin-walled electricity welded tubes with reduced internal flash [BLL-BISI-TRANS-22361-(9022.06)] N85-28364
Production of electrically welded tubes with removed internal flash [BLL-BISI-TRANS-22362-(9022.06)] N85-28367
ELECTRIC WIRE
Multiconductor flat cable [AD-D011635] N85-28218
ELECTRICAL FAULTS
Energy considerations in second breakdown [AD-A152389] N85-28229
Analysis of time dependent dielectric failures [AD-A153200] N85-28243
ELECTRICAL MEASUREMENT
Measurement methods for accurate microwave characterization and modeling of MESFET chips [AD-A152360] N85-28227
Voltammetric analysis of ordnance materials. Part 2: A portable digital voltammeter for use with a silver wire working electrode [AD-A152480] N85-28325
ELECTRICAL PROPERTIES
Completely consumed carbide: A new process for dielectric isolation [AD-A152379] N85-27987
Effects of processing chemistry on electrical properties of high field ZnO varistors [DE85-007668] N85-28254
GaAs MESFET with lateral non-uniform doping N85-28827
Materials-process interactions in ternary alloy semiconductors [AD-A153133] N85-28832
Properties of defects in Hg(1-x)Cd(x)Te [AD-A153243] N85-28835

ELECTRICAL RESISTANCE
Ohmic potential drop and gas bubble radius distribution in alkaline water electrolysis N85-28025
Thin films properties of sputtered niobium silicide on SiO2, Si3N4 and on n+ poly-Si [AD-A152378] N85-28228
Effects of the structural state in thermo-bimetals on their resistance to microscopic plastic deformation [BLL-BISI-TRANS-22403-(9022.06)] N85-28412
Leakage effects in n-GaAs MESFET with n-GaAs buffer layer N85-28826

ELECTRICAL RESISTIVITY
Electrochemistry of polymer films not immersed in solution: Electron transfer on an ion budget [AD-A152989] N85-27998

ELECTRO-OPTICS
Construction and analysis of a PRIZ spatial light modulator exhibiting dynamic image selection [AD-A152318] N85-28787
Spatial light modulator having a capacitively coupled photoconductor [AD-D011646] N85-28790
InP materials [AD-A152341] N85-28828

ELECTROCATALYSTS
Oxygen evolution on NiCo2O4 electrodes N85-28026

ELECTROCHEMICAL CORROSION
Electrical research on solar cells and photovoltaic materials [NASA-CR-175897] N85-28452

ELECTROCHEMISTRY
Electrochemistry of polymer films not immersed in solution: Electron transfer on an ion budget [AD-A152989] N85-27998

ELECTRODES
Electrochemistry of polymer films not immersed in solution: Electron transfer on an ion budget [AD-A152989] N85-27998
The behaviour of nitride inclusions in nickel-base alloys [BLL-BISI-TRANS-22396-(9022.06)] N85-28058
Spark gap electrode erosion [AD-A152802] N85-28237
Electrodes for flash discharge lamps [DE85-008897] N85-28250
Electrode for flash discharge lamps [DE85-008896] N85-28252

ELECTROHYDRODYNAMICS
Ac field-induced order in dense colloidal systems [DE85-009107] N85-28119

ELECTROLYSIS
Ohmic potential drop and gas bubble radius distribution in alkaline water electrolysis N85-28025
Oxygen evolution on NiCo2O4 electrodes N85-28026
Corrosion characteristics of some steels produced through a self-cleaning rotating electrode [BLL-BISI-TRANS-22046-(9022.06)] N85-28034

ELECTROLYTES
Process for clarification of water [DE85-007864] N85-28023
Investigation of the structure and dynamics of electrolytes in solvents used for primary and secondary Li-batteries [AD-A153099] N85-28240
Bifunctional oxygen electrodes [DE85-006871] N85-28248

ELECTROMAGNETIC FIELDS
ELF (Extremely Low Frequency) communications system ecological monitoring program: Measurements of ELF electromagnetic fields for site selection and characterization, 1983 [AD-A153120] N85-28209
Biological and human health effects of extremely low frequency electromagnetic fields. Post-1977 literature review [AD-A152731] N85-28539

ELECTROMAGNETIC INTERACTIONS
Modern test of chiral anomalies [DE85-005892] N85-28680
Electroweak interactions in nuclei [DE85-007811] N85-28762
Energy and Technology Review [DE85-004358] N85-28868

ELECTROMAGNETIC PULSES
Energy and Technology Review [DE85-004358] N85-28868

ELECTROMAGNETIC RADIATION
X-ray emission and the winds of cataclysmic variables [DE85-007663] N85-28902

ELECTROMAGNETIC SCATTERING
Application of forward scattering renormalization to scattering in turbid media [AD-A153232] N85-28271

ELECTROMAGNETIC WAVE TRANSMISSION
The weighting function for scintillation on a folded path [AD-A152659] N85-28206
Electromagnetic transmission through a slot in a perfectly conducting plane [AD-A153224] N85-28210

ELECTROMECHANICAL DEVICES
Optimum dimensions of power solenoids for magnetic suspension [NASA-TM-77864] N85-28716

ELECTRON ACCELERATORS
Transverse electron resonance accelerator [DE85-006289] N85-28758

ELECTRON BEAMS
In situ HVEM studies of electron beam-driven compositon changes in thin film alloys: Displacement-rate gradient effects [DE85-007992] N85-28092
Uniaxial angular accelerometers N85-28173
VULTURE manual [DE85-006873] N85-28631
Wake fields and wake field acceleration [DE85-008054] N85-28750
Measurement and interpretation of electron angle at MABE beam stop [DE85-006583] N85-28755
Transverse electron resonance accelerator [DE85-006289] N85-28758
Restrike particle beam experiments on a dense plasma focus. Opening switch research on a dense plasma focus [AD-A152991] N85-28802

ELECTRON DENSITY (CONCENTRATION)
EISCAT electron density studies [AD-A152820] N85-28498
Electron and ion distributions at high latitudes as measured by the Air Force polar orbiting satellites [AD-A153242] N85-28500
Memory function for cyclotron resonance of two-dimensional electron systems [AD-A152632] N85-28731

ELECTRON DENSITY PROFILES
Electrons and grain boundary energies in metals [DE85-009530] N85-28099

ELECTRON DISTRIBUTION
Electron and ion distributions at high latitudes as measured by the Air Force polar orbiting satellites [AD-A153242] N85-28500

ELECTRON EMISSION
Electrodes for flash discharge lamps [DE85-008897] N85-28250
Electrode for flash discharge lamps [DE85-008896] N85-28252
VULTURE manual [DE85-006873] N85-28631

ELECTRON ENERGY
Digital filters for application to data analysis in electron energy loss spectroscopy [DE85-007932] N85-28020
The mean trajectory approximation for charge and energy transfer processes at surfaces [AD-A152708] N85-28830

ELECTRON GUNS
Design and testing of a high power quasi-optical gyrotron [AD-A153212] N85-28330

ELECTRON MASS
Incorporation of Monte Carlo electron interface studies into photon general cavity theory [DE85-007674] N85-28772

ELECTRON MICROSCOPES
Scanning electron microscope facility for examination of radioactive materials [DE85-008127] N85-28335

ELECTRON MICROSCOPY
In situ HVEM studies of electron beam-driven composition changes in thin film alloys: Displacement-rate gradient effects [DE85-007992] N85-28092

ELECTRON SCATTERING
Wake fields and wake field acceleration [DE85-008054] N85-28750
Possible indication of an A-dependence of R in deep-inelastic electron scattering from nuclei [DE85-008174] N85-28763

ELECTRON SPECTROSCOPY
Digital filters for application to data analysis in electron energy loss spectroscopy [DE85-007932] N85-28020

ELECTRON STATES
Experimental study of dissociative attachment in optically-pumped lithium molecules [AD-A152800] N85-28738

ELECTRON TRAJECTORIES
Laser measurements of distances from the ORELA neutron target to experiment stations along flight paths 1 and 6 [DE85-009457] N85-28352

ELECTRON TRANSFER
Electrochemistry of polymer films not immersed in solution: Electron transfer on an ion budget [AD-A152989] N85-27998
Photochemistry of coordination complexes: The phthalocyanines [DE85-007693] N85-28022

ELECTRON TUNNELING
Research on superconductive signal-processing devices [AD-A152703] N85-28235

ELECTRONIC CONTROL
Commercialization of the power factor controller [NASA-CR-171500] N85-28221
Development of mass-producible line-focus tracking concentrating solar collectors. Category 2: Control systems [DE85-007873] N85-28459

ELECTRONIC COUNTERMEASURES
Adaptive nulling at HF using a compact array of active parasitic antennas [AD-A152582] N85-28203

ELECTRONIC EQUIPMENT TESTS
The Avionics Flight Evaluation System (AFES) of DFVLR [DFVLR-MITT-85-01] N85-27864
Measurement methods for accurate microwave characterization and modeling of MESFET chips [AD-A152360] N85-28227
The GfW handbook for data compilation of irradiation tested electronic components, volume 3 [HMI-B-353-VOL-3] N85-28258

ELECTRONIC MAIL
Interfacing the VAX 11/780 using berkeley UNIX 4.2BSD and Ethernet based Xerox Network Systems [AD-A153174] N85-28647

ELECTRONIC SPECTRA
The electronic spectra of phthalocyanine radical anions and cations [AD-A152328] N85-27986

ELECTRONS
Effects of level broadening on the magnetothermal oscillations in two-dimensional electron systems [AD-A152639] N85-28732
Hall mobility in fluid argon [DE85-007288] N85-28840

ELECTROSTATICS
VULTURE manual [DE85-006873] N85-28631

ELEMENTARY PARTICLE INTERACTIONS
Modern test of chiral anomalies [DE85-005892] N85-28680
Elementary particle theory [DE85-006803] N85-28771

ELEVATORS (CONTROL SURFACES)
Proposals for the determination of necessary elevator handling characteristics of sailplanes in high speed range [DFVLR-FB-84-52] N85-27882

ELIMINATION
Comparison of two algebraic methods for curve/curve intersection N85-28591

ELLIPTIC DIFFERENTIAL EQUATIONS
Generation of surface coordinates by elliptic partial differential equations N85-28583
Numerical methods for stiff ordinary and elliptic partial differential equations [AD-A153247] N85-28675

EMBRITTLEMENT
Effect of texture in steel on the susceptibility of hydrogen embrittlement [BLL-BISI-TRANS-22026-(9022.06)] N85-28048

EMERGENCIES
Survivable ground base sensor [AD-D011647] N85-28213

EMISSION SPECTRA
A new luminosity component in 3C48 [NASA-CR-175840] N85-28894

EMULSIONS
Combustion and micro-explosion of water/oil emulsions in high pressure environments [AD-A152960] N85-27997

ENCAPSULATING
Hot Isostatic Pressing (HIP): Techniques, applications and economical use [JUEL-SPEZ-288] N85-28141
Encapsulation and packaging of a semiconductor multielectrode array for cortical implantation [AD-A153180] N85-28535

END-TO-END DATA SYSTEMS
The IRAS end-to-end data system
[NLR-MP-83056-U] N85-28883
ENERGY ABSORPTION FILMS
Selective coatings for solar heat converters
N85-28144
ENERGY CONSERVATION
A numerical solution technique for multitemperature plasma hydrodynamics
[AD-A152701] N85-28801
ENERGY CONVERSION
Documents of the JPL Photovoltaics Program Analysis and Integration Center: An annotated bibliography
[NASA-CR-175873] N85-28448
Energy data base: Subject categories and scope
[DE84-017376] N85-28881
ENERGY CONVERSION EFFICIENCY
A program for the calculation of paraboloidal-dish solar thermal power plant performance
[NASA-CR-175874] N85-28449
ENERGY DISSIPATION
Digital filters for application to data analysis in electron energy loss spectroscopy
[DE85-007932] N85-28020
Energy considerations in second breakdown
[AD-A152389] N85-28229
Tribological sinks: Money down the drain
[DE85-010019] N85-28376
ENERGY LEVELS
Multiple scattering effects in low energy alkali ion scattering: Application to the analysis of adsorbate ordering and bonding geometry
[DE85-007575] N85-28757
Extension of the consistent Q formalism to odd-A nuclei in the W-Pt region
[DE85-006284] N85-28770
ENERGY POLICY
USSR report: Engineering and equipment
[JPRS-UEQ-85-004] N85-28142
Navy geothermal plan
[AD-A152478] N85-28450
ENERGY REQUIREMENTS
Relative potentials of concentrating and two-axis tracking flat-plate photovoltaic arrays for central-station applications
[NASA-CR-175889] N85-28446
ENERGY SPECTRA
Restrike particle beam experiments on a dense plasma focus. Opening switch research on a dense plasma focus
[AD-A152991] N85-28802
ENERGY STORAGE
Operating characteristics of a 0.87 kW-hr
[NASA-TM-87038] N85-28371
Relative potentials of concentrating and two-axis tracking flat-plate photovoltaic arrays for central-station applications
[NASA-CR-175889] N85-28446
Documents of the JPL Photovoltaics Program Analysis and Integration Center: An annotated bibliography
[NASA-CR-175873] N85-28448
ENERGY TECHNOLOGY
Documents of the JPL Photovoltaics Program Analysis and Integration Center: An annotated bibliography
[NASA-CR-175873] N85-28448
Shenandoah parabolic dish solar collector
[DE85-008326] N85-28460
Multicriteria decision analysis as an aid to strategic planning of energy research and development
[REPT-84-02] N85-28870
Energy data base: Subject categories and scope
[DE84-017376] N85-28881
ENERGY TRANSFER
CALTECH-DOE program on numerical analysis, computing and fundamental studies of motion, energy and mass transfer in fluids
[DE85-008106] N85-28274
Flow characteristics of a partially submerged liquid pickup
[DE85-008744] N85-28276
Theory of laser-stimulated surface process. 2: A generalized-master-equation approach to energy transfer between an IR laser, an aspecties and phonons
[AD-A153083] N85-28344
Average collisional vibrational energy transfer quantities and the inversion temperature
[AD-A152674] N85-28733
Electronically excited alkaline earth oxides: Chamical production and collisional energy transfer processes
[AD-A153172] N85-28833
ENGINE DESIGN
Ceramic applications in turbine engines
[NASA-CR-174715] N85-28109
Analysis of physical-chemical processes governing SSME internal fluid flows
[NASA-CR-175893] N85-28261
ENGINE NOISE
Fan noise suppression in turbofan engines
[B8580076] N85-27872
ENGINE PARTS
Spacer structure
[AD-D011641] N85-27866
Optical strain measurement system development
N85-27969
Ceramic applications in turbine engines
[NASA-CR-174715] N85-28109
Determination of wear intensity and resource of crankshafts and cylinder liners of ZIL-130 and ZMZ-53 engines
[BLL-BISI-TRANS-21393-(9022.06)] N85-28355
Ceramic turbochargers: A case study of a near-term application of high-strength ceramics
[DE85-006495] N85-28378
Future of ceramic turbochargers: Promises and pitfalls
[DE85-006209] N85-28380
ENGINE TESTS
Ceramic applications in turbine engines
[NASA-CR-174715] N85-28109
Determination of wear intensity and resource of crankshafts and cylinder liners of ZIL-130 and ZMZ-53 engines
[BLL-BISI-TRANS-21393-(9022.06)] N85-28355
ENTIRE FUNCTIONS
A note on integral operators
[REPT-83-28] N85-28688
ENTROPY
Cluster production and entropy
[DE85-007626] N85-28752
ENTROPY (STATISTICS)
The role of duality in optimization problems involving entropy functionals, with applications to information theory
[AD-A152336] N85-28713
ENVIRONMENT EFFECTS
ELF (Extremely Low Frequency) communications system ecological monitoring program: Measurements of ELF electromagnetic fields for site selection and characterization, 1983
[AD-A153120] N85-28209
Investigation of air pollution impact in Eastern Bavaria: Measurement results from August and September, 1984
[DFVLR-FB-85-03] N85-28471
ENVIRONMENT POLLUTION
An ultrasensitive and element specific photoionization detection system for environmental analysis
[AD-A153365] N85-28332
ENVIRONMENT SIMULATION
Testing of materials and coatings for jet engine components under simulated operational conditions
[B8580073] N85-27873
ENVIRONMENTAL MONITORING
Investigation of air pollution impact in Eastern Bavaria: Measurement results from August and September, 1984
[DFVLR-FB-85-03] N85-28471
DFVLR measuring system for the determination of the spatial distribution of environmental parameters of the atmosphere by means of mobile instrumented platforms
[DFVLR-FB-85-09] N85-28472
ENVIRONMENTAL QUALITY
An ultrasensitive and element specific photoionization detection system for environmental analysis
[AD-A153365] N85-28332
ENVIRONMENTS
Computing environments for data analysis. Part 1: Introduction
[DE85-007919] N85-28603
Computing environments for data analysis. Part 2: Hardware
[DE85-008320] N85-28604
EPOXY RESINS
New polymers for composites: A summary of research on polystyrylpyridines
[NASA-CR-175888] N85-28106
EQUATIONS OF MOTION
Use of quaternions in flight mechanics
[AD-A152616] N85-27875
Incorporating control into the optimal structural design of large flexible space structures
[AD-A152858] N85-27937
Stability in dynamical systems
[DE85-006696] N85-28766
The role of thermal motions of air particles for fireballs
[PUBL-59] N85-28900
EQUATIONS OF STATE
Cluster production and entropy
[DE85-007626] N85-28752
EQUIVALENCE
A trivariate version of Levy's equivalence
[AD-A153157] N85-28705
EQUIVALENT CIRCUITS
Measurement methods for accurate microwave characterization and modeling of MESFET chips
[AD-A152360] N85-28227
ERROR CORRECTING DEVICES
SC filters and design centering of integrated circuits. Part 2: Design centering of integrated circuits
[BMFT-FB-T-84-265-PT-2] N85-28257
ERRORS
Spectral decomposition and verification of NOGAPS 500MB medium-range forecasts
[AD-A152550] N85-28520
A high-accuracy optical linear algebra processor for finite element applications
[NASA-CR-175894] N85-28658
Effects of inspection errors on curtailed Dorfman-type procedures
[AD-A152376] N85-28699
Statistical effects of imperfect inspection sampling. Part 2: Double sampling, link sampling and grading
[AD-A152377] N85-28700
ESTIMATES
Conformational and mechanical properties at high strain rates
[AD-A153401] N85-28272
ESTIMATING
Methods for optimal recursive estimation of non-stationary time series, applications to atomic time and frequency metrology N85-28312
Numerical estimation of the curvature of biological surfaces N85-28588
Nonsmooth analysis and Frechet differentiability of M-functionals
[AD-A152932] N85-28668
ESTUARIES
Water quantity and quality research for the Rhine Meuse estuary
[PUBL-325] N85-28470
ETCHING
Apparatus for etching vertical junction solar cell wafers
[AD-D011653] N85-28443
Morphology of GaAs/sub 1-x/P/sub x/ superlattices grown by MOCVD and chloride VPE
[DE85-002944] N85-28842
ETHERS
Polyaromatic ether-sulfone-keytones with fluoro-substituted-p-cyclophane units as cross-linking sites
[AD-D011649] N85-28105
ETHYL ALCOHOL
Alcohol Fuels Program technical review, spring 1984
[DE85-002919] N85-28134
EULER EQUATIONS OF MOTION
Upwind-difference methods for aerodynamic problems governed by the Euler equations
[REPT-84-23] N85-27834
Unsteady flow in multistage turbines N85-27946
Relaxation methods for hyperbolic equations
[REPT-84-20] N85-28687
EULER-CAUCHY EQUATIONS
Propagation of non-axisymmetric elastic waves through shell with filler under radial load at one end N85-28169
EURECA (ESA)
Botany facility phase A study. Core payload number 6 EURECA carrier, volume 1
[ESA-CR(P)-1978-VOL-1] N85-27918
Botany facility phase A study. Core payload number 6 for EURECA carrier, volume 2
[BF-TD-DRD-03-VOL-2] N85-27919
EUROPE
Rotterdam Airport and the Common Market
N85-27840
West Europe report: Science and technology
[JPRS-WST-84-024] N85-28183
Air Weather Service (AWS) climatic briefs: Europe
[AD-A152526] N85-28519
EUROPEAN SPACE AGENCY
Timing of spacecraft data: Time accuracy requirements and timing facilities of the European Space Agency (ESA) N85-28307
Documentation for the West German Federal Cabinet's space policy decision N85-28866
EUROPEAN SPACE PROGRAMS
European utilization aspects of a US manned space station, volume 1
[ESA-CR(P)-1987-VOL-1] N85-27926
European utilization aspects of a US manned space station, volume 2
[ESA-CR(P)-1987-VOL-2] N85-27927
In orbit infrastructure. Volume 1: Executive summary — European space programs
[RX011-002/84-VOL-1] N85-27928
Documentation for the West German Federal Cabinet's space policy decision N85-28866

EUTECTIC ALLOYS
Multi-phase crystallization of ferrous alloys
[BLL-BISI-TRANS-22441-(9022.06)] N85-28037
EUTECTICS
Influence of eutectic silicate inclusions on micro-processes during deformation and fracture of 12GS steel
[BLL-BISI-TRANS-22296-(9022.06)] N85-28073
EVALUATION
Evaluation of used crankcase oils using computerized infrared spectrometry. Appendices
[AD-A152994] N85-28000
On-orbit frequency stability analysis of the GPS NAVSTAR's 3 and 4 rubidium clocks and NAVSTAR's 5 and 6 cesium clocks N85-28295
Test and evaluation plan for the Centralized Storm Information System N85-28508
CSIS test and evaluation N85-28509
EXCITATION
A study of excitations during collisionally-induced electron detachment of negative ions
[AD-A152879] N85-28739
Extension of the consistent Q formalism to odd-A nuclei in the W-Pt region
[DE85-008284] N85-28770
EXHAUST EMISSION
Clean-burning diesel engines
[AD-A152606] N85-28374
EXHAUST FLOW SIMULATION
Calculation of viscous compressible flows in small gas turbines N85-27950
EXHAUST GASES
High resolution spectroscopy of C13O16 in gas mixtures
[AD-A152625] N85-27991
Clean-burning diesel engines
[AD-A152606] N85-28374
EXHAUST SYSTEMS
Exhaust systems for passenger vehicles: Test procedure for resistance to internal corrosion of silencers
[BLL-BISI-TRANS-22360-(9022.06)] N85-28361
EXOBIOLOGY
The cosmic history of the biogenic elements and compounds
[NASA-SP-476] N85-28562
EXOSPHERE
Advances in technology development for exoatmospheric research
[AD-A152581] N85-28495
EXPERIMENT DESIGN
Botany facility phase A study. Core payload number 6 EURECA carrier, volume 1
[ESA-CR(P)-1978-VOL-1] N85-27918
Botany facility phase A study. Core payload number 6 for EURECA carrier, volume 2
[BF-TD-DRD-03-VOL-2] N85-27919
Laboratory research: A question of when, not if
[AD-A153298] N85-28867
EXPERT SYSTEMS
Composite loads spectra for select space propulsion structural components: Probabilistic load model development N85-27954
Evidential reasoning in expert systems for image analysis
[AD-A153379] N85-28627
EXPLOSIONS
Combustion and micro-explosion of water/oil emulsions in high pressure environments
[AD-A152960] N85-27997
EXPLOSIVE WELDING
Examination of the regions of the joint of sheets bonded by the explosive welding technique
[BLL-BISI-TRANS-22352-(9022.06)] N85-28370
EXTERNAL STORES
Flight trials of a modified gulfstream commander carrying external stores
[AD-A153376] N85-27859
EXTERNAL TANKS
Analysis of heat-transfer measurements from 2 AEDC wind tunnels on the Shuttle external tank
[NASA-CR-171470] N85-28263
EXTRATERRESTRIAL MATTER
Activities report of the Institute for Extraterrestrial Physics
[MPI-PAE/EXTRATERR-187] N85-28898
EXTRATERRESTRIAL RADIATION
Activities report of the Institute for Extraterrestrial Physics
[MPI-PAE/EXTRATERR-187] N85-28896
EXTRATERRESTRIAL RADIO WAVES
Forecast verification of the 10.7 centimeter solar flux and the Ap daily geomagnetic activity indices
[AD-A152959] N85-28499
EXTREMELY LOW FREQUENCIES
Biological and human health effects of extremely low frequency electromagnetic fields. Post-1977 literature review
[AD-A152731] N85-28539
EYE (ANATOMY)
Pursuit tracking performance and flash disruption: The effects of training the non-dominant eye on target reacquisition
[AD-A153404] N85-28541

F

F REGION
EISCAT electron density studies
[AD-A152820] N85-28498
F-16 AIRCRAFT
Application of AFTI/F-16 task-tailored control modes in advanced multirole fighters N85-27888
F-111 AIRCRAFT
Automatic flight control modes for the AFTI/F-111 mission adaptive wing aircraft N85-27909
FABRICATION
Production and compaction of amorphous metal powders
[BLL-BISI-TRANS-22387-(9022.06)] N85-28080
Process for making electrodes for discharge tubes
[DE85-008898] N85-28247
Electrode for flash discharge lamps
[DE85-008896] N85-28252
Effects of processing chemistry on electrical properties of high field ZnO varistors
[DE85-007688] N85-28254
Laser welder for fabricating neutron tubes
[DE85-009965] N85-28377
Inspection of welds and the factors improving its effectiveness in welded structure fabrication
[BLL-BISI-TRANS-22194-(9022.06)] N85-28387
FACTORIZATION
Symbolic Givens reduction in large sparse least squares problems
[DE85-008685] N85-28681
FAIL-SAFE SYSTEMS
Automatic flight control modes for the AFTI/F-111 mission adaptive wing aircraft N85-27909
FAILURE
VLSI (Very large scale integrated circuits) device reliability models
[AD-A153268] N85-28245
Inequalities for distributions with increasing failure rate
[AD-A152812] N85-28390
Optimally robust redundancy relations for failure in uncertain systems
[NASA-CR-175953] N85-28391
Critical conditions for failure in materials subjected to high rates of loading
[AD-A153135] N85-28420
FAILURE ANALYSIS
ACT applied to helicopter flight control N85-27891
Experimental measurements and analysis of heat transfer and gas dynamics in a rotating turbine stage N85-27949
Strength and failure analysis of composite laminates with holes at room and elevated temperatures
[AD-A153263] N85-27981
Influence of thermochemical treatment on properties of low-carbon steel
[BLL-BISI-TRANS-22410-(9022.06)] N85-28055
Inequalities for distributions with increasing failure rate
[AD-A152812] N85-28390
Optimally robust redundancy relations for failure in uncertain systems
[NASA-CR-175953] N85-28391
Method of assessment of start of slow crack growth by acoustic emission technique
[BLL-BISI-TRANS-21762-(9022.06)] N85-28722
FAILURE MODES
Recent progress in the dynamic plastic behaviour of structures, part 4 N85-28402
On validity of threshold values of fatigue strength of steel structures
[BLL-BISI-TRANS-22192-(9022.06)] N85-28408
FAR INFRARED RADIATION
Balloon-borne, He-cooled Fourier transform spectrometer for far infrared astronomy
[MPE-IR-41] N85-28899
FAR ULTRAVIOLET RADIATION
Photoionization mass spectrometry with VUV hydrogen laser source
[AD-A153362] N85-28009
FATIGUE (MATERIALS)
Structural Integrity and Durability of Reusable Space Propulsion Systems
[NASA-CP-2381] N85-27941
Interaction of high-cycle and low-cycle fatigue of Haynes 188 alloy at 1400 F deg N85-27961
Reexamination of cumulative fatigue damage laws N85-27962
The synergistic actions of stress corrosion cracking and corrosion fatigue
[BLL-BISI-TRANS-22334-(9022.06)] N85-28045
Characterization of the fatigue and slow crack growth behavior of partially stabilized zirconia ceramics
[DE85-005240] N85-28113
Relaxation properties and fatigue fracture resistance of austenitic spring steel
[BLL-BISI-TRANS-22300-(9022.06)] N85-28406
Fatigue crack propagation characteristics and fatigue fracture toughness in 780 MPa grade high strength steel weldments at low temperature
[BLL-BISI-TRANS-22368-(9022.06)] N85-28411
Fatigue of synthetic fibers for marine rope applications
[MIT-R84-2] N85-28414
Fatigue behavior of synthetic fibers, yarns and ropes N85-28415
The effects of sea water and concentrated salt solutions on the fatigue of nylon 6,6 fibers N85-28416
Interaction among inhomogeneities and inclusions
[AD-A153114] N85-28419
Evaluation of interpolative modeling concepts for fatigue crack growth at elevated temperature
[AD-A153222] N85-28422
Fatigue strength of Inconel 625 plate and weldments used in the DIII-D configuration vacuum vessel
[DE85-008276] N85-28427
FATIGUE LIFE
Experimental measurements and analysis of heat transfer and gas dynamics in a rotating turbine stage N85-27949
Flow-induced vibration of SSME main injector liquid-oxygen posts N85-27951
FATIGUE TESTS
Lubricant and additive effects on spur gear fatigue life
[NASA-TM-87044] N85-28373
Tests of low-cycle fatigue of elected steels of class 11
[BLL-BISI-TRANS-22039-(9022.06)] N85-28404
FATTY ACIDS
Fatty and aromatic acid catabolizing bacteria from methanogenic ecosystems
[DE85-008133] N85-28537
FAULT TOLERANCE
Efficient VLSI (Very Large Scale Integration) fault simulation
[AD-A152661] N85-28233
Optimal design and use of retry in fault tolerant real-time computer systems
[NASA-CR-175920] N85-28643
FEASIBILITY ANALYSIS
Transverse electron resonance accelerator
[DE85-008289] N85-28758
FEED SYSTEMS
Inspection evaluation and repair of the flawed feedwater nozzle of the 50 MWe Dodewaard GKN boiling water reactor
[ISBN-90-353-0017-3] N85-28394
FEEDBACK
Principles of designing digital compensating accelerometers N85-28172
FEEDBACK CIRCUITS
Experimental performance of a frequency measurement circuit
[AD-A152951] N85-28239
FEEDBACK CONTROL
Stabilizing force feedback in bio-actuated control systems
[AD-D011634] N85-28560
FERRITES
Mechanical stabilization of austenite against epsilon martensite and its effect on deformation behavior in high manganese steels
[DE85-007654] N85-28097
FERRITIC STAINLESS STEELS
Properties of corrosion resistant stabilized ferritic steels
[BLL-BISI-TRANS-22519-(9022.06)] N85-28039
Stainless steels: Application and welding
[BLL-BISI-TRANS-22357-(9022.06)] N85-28059
FERROMAGNETIC MATERIALS
NMR manometer for measuring high pressures at liquid-helium temperatures N85-28171
FERROMAGNETISM
Central limit theorems in the area of large deviations for some dependent random variables
[AD-A153125] N85-28831
FEYNMAN DIAGRAMS
Introduction to LINE: A Feynman diagram graphic operator
[DE85-009299] N85-28832

FIBER COMPOSITES
Designing for fiber composite structural durability in hygrothermomechanical environment
[NASA-TM-87045] N85-27978
Titanium metal-matrix composites
[AD-D011643] N85-28086
FIBER OPTICS
Performance evaluation of fiber-optic converters N85-28154
Derated application of parts for (Electronic Systems Division) systems development. Revision
[AD-A153299] N85-28246
Studies of optical-beam phase-conjugation by nonlinear refraction
[AD-A152865] N85-28788
FIBER REINFORCED COMPOSITES
Reaction-bonded and fiber-reinforced SiC static and dynamic gas turbine components
[BMFT-FB-T-84-302] N85-27874
Aluminum-lithium alloys: The answer of the aluminum industry to the threat of advanced fiber-reinforced materials
[VTH-LR-406] N85-28102
FIBERS
A micrographic and gravimetric study of intercalation and deintercalation of graphite fibers
[NASA-TM-87026] N85-28110
Experiments and micromechanical models for creep-rupture in polymer matrix composites
[DE85-009533] N85-28118
FIELD EFFECT TRANSISTORS
Measurement methods for accurate microwave characterization and modeling of MESFET chips
[AD-A152360] N85-28227
Communications and logic systems at millimeter wave frequencies
[NASA-CR-175859] N85-28824
Communications and logic systems at millimeter wave frequencies, summary N85-28825
Leakage effects in n-GaAs MESFET with n-GaAs buffer layer N85-28826
GaAs MESFET with lateral non-uniform doping N85-28827
Further development of high voltage SIPMOS FET's to fulfill market needs
[BMFT-FB-T-84-255] N85-28843
FIELD THEORY (ALGEBRA)
Field theory analysis using the finite element method to determine the deliberation curves of three dimensional fracture mechanics specimens with a semicircular surface crack applying the electrical direct current potential method for crack depth measurement
[GKSS-84/E/53] N85-28434
Special relativity of Kaluza-Klein
[DE85-007838] N85-28847
FIELD THEORY (PHYSICS)
Coherent state description of non-topological solitons and momentum projection
[DE85-007814] N85-28761
FIGHTER AIRCRAFT
Operational and developmental experience with the F/A-18A digital flight control system N85-27895
Flight testing and development of the F/A-18A digital flight control system N85-27896
The flight control system for the Experimental Aircraft Programme (EAP) demonstration aircraft N85-27908
FILAMENT WINDING
SRB filament wound case material property study
[NASA-CR-171469] N85-27940
FILLERS
Propagation of non-axisymmetric elastic waves through shell with filler under radial load at one end N85-28169
FINITE DIFFERENCE THEORY
Analysis and modeling for thermal focal plane arrays
[AD-A153156] N85-28329
A discussion of adaptive grids and their applicability in numerical hydrodynamic modeling
[AD-A151843] N85-28659
Spatial differencing for finite difference codes
[DE85-008902] N85-28684
A numerical solution technique for multitemperature plasma hydrodynamics
[AD-A152701] N85-28801
FINITE ELEMENT METHOD
Probabilistic finite element development N85-27956
Probabilistic finite element: Variational theory N85-27957
Designing for fiber composite structural durability in hygrothermomechanical environment
[NASA-TM-87045] N85-27978
Analytical shear buckling investigation of curved composite panels
[AD-A153138] N85-28421
Field theory analysis using the finite element method to determine the deliberation curves of three dimensional fracture mechanics specimens with a semicircular surface crack applying the electrical direct current potential method for crack depth measurement
[GKSS-84/E/53] N85-28434
Implementation of a general finite element code on an IBM PC compatible microcomputer
[AD-A152681] N85-28615
TRINITY: A pre- and post-processing program for 2-dimensional finite element data
[DE85-008029] N85-28628
Numerical benchmark study for the finite element computer code NEPTUNE
[DE85-008400] N85-28630
A high-accuracy optical linear algebra processor for finite element applications
[NASA-CR-175894] N85-28658
A discussion of adaptive grids and their applicability in numerical hydrodynamic modeling
[AD-A151843] N85-28659
A fast implementation of explicit time stepping algorithms with the finite element method for a class of nonlinear evolution problems
[REPT-84-03] N85-28686
FINITE VOLUME METHOD
Unsteady flow in multistage turbines N85-27946
FINLAND
Precipitation and snow cover data, 1977
[ISBN-951-697-215-2] N85-28514
FIRE PREVENTION
Evaluation of pyrotechnic fire suppression system for six pyrotechnic compositions
[AD-A152995] N85-28130
FIRES
Evaluation of pyrotechnic fire suppression system for six pyrotechnic compositions
[AD-A152995] N85-28130
Laboratory modeling of aspects of large fires
[AD-A153152] N85-28138
FISCHER-TROPSCH PROCESS
Michelle-derived catalysts for extended Schulz-Flory
[DE85-005656] N85-28012
Catalyst and reactor development for a liquid phase Fischer-Tropsch process
[DE85-005894] N85-28014
FIXED POINTS (MATHEMATICS)
Towards a uniform topological treatment of streams and functions on streams
[CWI-CS-R8422] N85-28639
FLAME PROPAGATION
Polynomial approaches for the characteristic velocity and flame temperature as a function of mixing compounding and pressure for the systems PMMA/O2, PMMA/air, PE/O2, PE/air, PS/O2 and PS/air
[VTH-LR-421] N85-28024
Laboratory modeling of aspects of large fires
[AD-A153152] N85-28138
FLAME TEMPERATURE
Elementary reactions of importance in oxidation, combustion ignition and flame inhibitions
[AD-A153139] N85-28004
Polynomial approaches for the characteristic velocity and flame temperature as a function of mixing compounding and pressure for the systems PMMA/O2, PMMA/air, PE/O2, PE/air, PS/O2 and PS/air
[VTH-LR-421] N85-28024
FLAMES
Elementary reactions of importance in oxidation, combustion ignition and flame inhibitions
[AD-A153139] N85-28004
FLAPERONS
Wing buffeting active control testing on a transport aircraft configuration in a large sonic windtunnel N85-27903
FLASH
Production of thin-walled electricity welded tubes with reduced internal flash
[BLL-BISI-TRANS-22381-(9022.06)] N85-28364
FLASH BLINDNESS
Pursuit tracking performance and flash disruption: The effects of training the non-dominant eye on target reacquisition
[AD-A153404] N85-28541
FLASH LAMPS
Electrodes for flash discharge lamps
[DE85-006897] N85-28250
Electrode for flash discharge lamps
[DE85-006896] N85-28252
FLASH POINT
Removal of longitudinal internal flash from electrically welded tubes
[BLL-BISI-TRANS-22380-(9022.06)] N85-28136
FLAT SURFACES
An experimental investigation of a turbulent junction vortex
[NASA-CR-175915] N85-28259
Boundary to constructive solid geometry mapings: A focus on 2-D issues N85-28570
Numerical estimation of the curvature of biological surfaces N85-28588
FLEXIBLE BODIES
Addition of flexible body option to the TOLA computer program, part 1
[NASA-CR-132732-1] N85-27855
Addition of flexible body option to the TOLA computer program. Part 2: User and programmer documentation
[NASA-CR-132732-2] N85-27856
FLEXING
Buckling and bracing of cantilevers
[CE-42] N85-28413
FLIGHT CHARACTERISTICS
In-flight investigation of the influence of pitch damping and pitch control effectiveness on landing approach flying qualities of statically unstable transport aircraft
[DFVLR-FB-84-12] N85-27880
FLIGHT CONTROL
Analysis of control system from a viewpoint of desired pole placement and desired degree of robustness
[AD-A152627] N85-27876
Design of robust controllers for a multiple input-multiple output control system with uncertain parameters application to the lateral and longitudinal modes of the KC-135 transport aircraft
[AD-A153100] N85-27877
Controller requirements for uncoupled aircraft motion, volume 1
[AD-A153173] N85-27878
Active Control Systems: Review, Evaluation and Projections
[AGARD-CP-384] N85-27883
The state-of-the-art and future of flight control systems N85-27885
A perspective on superaugmented flight control advantages and problems N85-27886
ACT applied to helicopter flight control N85-27891
Some flight test results with redundant digital flight control systems N85-27892
Active control technology experience with the Space Shuttle in the landing regime N85-27900
The aerodynamics of control N85-27901
The STOL and maneuver technology program integrated control system development N85-27910
The evolution of active control technology systems for the 1990's helicopter N85-27911
FLIGHT CREWS
Guidelines of the Federal Minister of Transportation for the formation and examination of airline personnel, part 4 N85-28556
FLIGHT HAZARDS
Flying in spite of the weather
[NLR-MP-84021-U] N85-27847
FLIGHT INSTRUMENTS
A preliminary investigation of handling qualities requirements for helicopter instrument flight during decelerating approach maneuvers and overshoot
[NRC-24173] N85-27857
FLIGHT MECHANICS
Use of quaternions in flight mechanics
[AD-A152816] N85-27875
Active Control Systems: Review, Evaluation and Projections
[AGARD-CP-384] N85-27883
FLIGHT SIMULATION
Technical evaluation of the Naval Automated Pilot Aptitude Measurement System (NAPAMS)
[AD-A152361] N85-28547
Adding computationally efficient realism to Monte Carlo turbulence simulation
[NASA-TP-2469] N85-28708
FLIGHT STABILITY TESTS
Identification of gust input and gust response characteristics from Do 28 TNT flight test data
[DFVLR-FB-84-48] N85-27881
Proposals for the determination of necessary elevator handling characteristics of sailplanes in high speed range
[DFVLR-FB-84-52] N85-27882
FLIGHT TESTS
USSR report: Transportation
[JPRS-UTR-84-025] N85-27841
Test flight of IL-76TD long-range transport variant N85-27842
A preliminary investigation of handling qualities requirements for helicopter instrument flight during decelerating approach maneuvers and overshoot
[NRC-24173] N85-27857

Flight trials of a modified gulfstream commander carrying external stores
[AD-A153376] N85-27859
Parameter identification results of tests in nonsteady symmetric flight with the Hawker Hunter Mk 7
[NLR-TR-83042-U] N85-27860
The Avionics Flight Evaluation System (AFES) of DFVLR
[DFVLR-MITT-85-01] N85-27864
In-flight investigation of the influence of pitch damping and pitch control effectiveness on landing approach flying qualities of statically unstable transport aircraft
[DFVLR-FB-84-12] N85-27880
Some flight test results with redundant digital flight control systems N85-27892
ACT flight research experience N85-27894
Flight testing and development of the F/A-18A digital flight control system N85-27896
OLGA: An open loop gust alleviation system N85-27897

FLIGHT TRAINING
Guidelines of the Federal Minister of Transportation for the formation and examination of airline personnel, part 4 N85-28556

FLIR DETECTORS
An analysis of the economic impact of the AN/APS-134 FLAR (Forward Looking Airborne Radar) retrofit on Coast Guard HC-130 aircraft
[AD-A152619] N85-28204

FLOW CHARACTERISTICS
Dependence of characteristics of centrifugal magnetohydrodynamic conduction pump on electrical conductance of end walls. Part 1: Experiment N85-28146

FLOW CHARTS
A test methodology for an automated and interactive software development environment
[AD-A152857] N85-28618

FLOW DISTRIBUTION
Static and dynamic pressure measurements on a NACA 0012 airfoil in the Ames High Reynolds Number Facility
[NASA-TP-2485] N85-27823
User's manual for airfoil flow field computer code SRAIR
[NASA-CR-172585] N85-27825
Predictions and measurements of isothermal flowfields in axisymmetric combustor geometries
[NASA-CR-174916] N85-27867
The gust simulation apparatus of the 3m x 3m low speed wind tunnel of the DFVLR in Goettingen, West Germany
[DFVLR-FB-85-04] N85-27920
Simulation of multistage turbine flows N85-27945
Unsteady flow in multistage turbines N85-27946
Feasibility of mapping velocity flow fields in SSME powerhead by laser anemometry techniques N85-27971
Proceedings of the 9th US Air Force and the Federal Republic of Germany Data Exchange Agreement Meeting, Viscous and Interacting Flow Field Effects
[AD-A153020] N85-28266
Vortices in non-Newtonian fluids
[AD-A153169] N85-28269

FLOW EQUATIONS
Steady, incompressible, inviscid flow through a finite collapsible tube under longitudinal tension
[REPT-84-01] N85-28278
A second-order pressure-correction method for viscous incompressible flow
[REPT-84-15] N85-28280
Flow through finite collapsible tubes: A branching problem
[REPT-84-29] N85-28281
On Long's solution to hydrostatic flow over mountains
[DFVLR-MITT-84-02] N85-28503
Relaxation methods for hyperbolic equations
[REPT-84-20] N85-28687
Fluid modeling of magnetized plasmas
[DE85-007679] N85-28804

FLOW GEOMETRY
Boundary layer and parabolic flows
[DFVLR-FB-84-46] N85-28285

FLOW THEORY
Calculation of viscous compressible flows in small gas turbines N85-27950
Boundary layer and parabolic flows
[DFVLR-FB-84-46] N85-28285

FLOW VELOCITY
Supersonic flow around blunt wedge N85-28158

FLOW VISUALIZATION
Convective storm downdraft outflows detected by NASA/MSFC's Airborne 10.6 micron pulsed Doppler Lidar System
[NASA-CR-3896] N85-28511

FLUENCE
Incorporation of Monte Carlo electron interface studies into photon general cavity theory
[DE85-007674] N85-28772

FLUID DYNAMICS
Apparatus for measuring velocity of sound in fluids N85-28175
Vortices in non-Newtonian fluids
[AD-A153169] N85-28269
FLOWPLOT 2: A fluid dynamics and heat transfer plotting package
[DE85-009802] N85-28277
Morphological stability and fluid dynamics of vapor crystal growth
[NASA-CR-175879] N85-28822
Morphological stability and fluid dynamics of vapor crystal growth
[NASA-CR-175880] N85-28823

FLUID FLOW
The effect of the Benthic Boundary Layer on the physics of intense mesoscale eddies
[AD-A153193] N85-28270
Experimental and theoretical studies on transport processes in laser welding
[DE84-008572] N85-28378
Numerical benchmark study for the finite element computer code NEPTUNE
[DE85-008400] N85-28630
Fluid modeling of magnetized plasmas
[DE85-007679] N85-28804

FLUID MECHANICS
USSR report: Engineering and equipment
[JPRS-UEQ-85-004] N85-28142
Buildup of oscillation of bodies in stratified fluid N85-28157
Fluid surface behavior in low gravity. Center discretionary fund no. 83-21
[NASA-TP-2486] N85-28260
TRINITY: A pre- and post-processing program for 2-dimensional finite element data
[DE85-008029] N85-28628

FLUIDIZED BED PROCESSORS
Conversion of methanol to gasoline: Engineering and construction of the demonstration plant
[DE85-003237] N85-28133

FLUORESCENCE
Measurement of Franck-Condon factors for the v'=0 progression in the B-X system of PO
[AD-A152734] N85-27993

FLUTTER
Flight trials of a modified gulfstream commander carrying external stores
[AD-A153376] N85-27859

FLUXES
Microcomputer-controlled system for measuring atmospheric particle fluxes
[DE85-007910] N85-28469

FLY BY WIRE CONTROL
Application of AFTI/F-16 task-tailored control modes in advanced multirole fighters N85-27888
X-29 digital flight control system design N85-27889
An update of experience on the fly by wire Jaguar equipped with a full-time digital flight control system N85-27893
Operational and developmental experience with the F/A-18A digital flight control system N85-27895
How to handle failures in advanced flight control systems of future transport aircraft N85-27905
The flight control system for the Experimental Aircraft Programme (EAP) demonstration aircraft N85-27908

FLYWHEELS
Operating characteristics of a 0.87 kW-hr
[NASA-TM-87038] N85-28371

FOCUSING
Streak tube characterization
[DE85-009874] N85-28255
DOE/Sandia point-focus concentrator program, draft
[DE85-008209] N85-28793

FOILS (MATERIALS)
Time-integrated yield for the Joint European Torus (JET), April - September 1984
[AERE-M-3449] N85-28797

FORCED VIBRATION
A study of internal and distributed damping for vibrating turbomachiner blades
[NASA-CR-175901] N85-27868

FORECASTING
Historical perspective on the Moon base: The British perspective
[DE85-005905] N85-27925
Forecast verification of the 10.7 centimeter solar flux and the Ap daily geomagnetic activity indices
[AD-A152959] N85-28499

FORESTS
A transport theory of millimeter wave propagation in woods and forests
[AD-A151883] N85-28196

FORGING
Precision die forging of blades or gas turbines N85-28148
Mechanizing of handling operations in drop forging with hammers and presses (conducted ergonomical examinations)
[BMFT-FB-HA-84-051] N85-28561

FORMALDEHYDE
The decomposition of gas phase formaldehyde by plasma discharge
[AD-A153202] N85-28007

FORMAT
A method to calculate the parameters of wings of arbitrary planform
[AD-A152689] N85-27831
Airport and airway system cost allocation model. Volume 7: User's manual
[AD-A152877] N85-27917

FORMING TECHNIQUES
Preparation of metal for cold upsetting
[BLL-BISI-TRANS-22383-(9022.06)] N85-28043
Application of 4-wire submerged arc method to welding UOE pipe
[BLL-BISI-TRANS-22417-(9022.06)] N85-28358
State of stress and penetration of plastic deformation in forming
[BLL-BISI-22199-(9022.06)] N85-28396

FORWARD SCATTERING
Application of forward scattering renormalization to scattering in turbid media
[AD-A153232] N85-28271

FOURIER SERIES
Extension of three theorems of Fourier series on the disc to the torus
[AD-A153017] N85-28669
Fourier coding and reconstruction of complicated contours
[REPT-84-39] N85-28691

FOURIER TRANSFORMATION
Balloon-borne, He-cooled Fourier transform spectrometer for far infrared astronomy
[MPE-IR-41] N85-28899

FRACTURE MECHANICS
Interaction of high-cycle and low-cycle fatigue of Haynes 188 alloy at 1400 F deg N85-27961
Experiments and micromechanical models for creep-rupture in polymer matrix composites
[DE85-009533] N85-28118
Conformational and mechanical properties at high strain rates
[AD-A153401] N85-28272
Inspection evaluation and repair of the flawed feedwater nozzle of the 50 MWe Dodewaard GKN boiling water reactor
[ISBN-90-353-0017-3] N85-28394
Measurement of fracture macro-geometry in evaluating fracture toughness
[BLL-BISI-TRANS-22241-(9022.06)] N85-28403
Fracture mechanics analysis of cold drawn Si-Cr valve steel
[BLL-BISI-TRANS-22216-(9022.06)] N85-28405
Relaxation properties and fatigue fracture resistance of austenitic spring steel
[BLL-BISI-TRANS-22300-(9022.06)] N85-28406
Critical conditions for failure in materials subjected to high rates of loading
[AD-A153135] N85-28420
High temperature fracture mechanics of silicon nitride
[BMFT-FB-T-84-285] N85-28433
Field theory analysis using the finite element method to determine the deliberation curves of three dimensional fracture mechanics specimens with a semicircular surface crack applying the electrical direct current potential method for crack depth measurement
[GKSS-84/E/53] N85-28434

FRACTURE STRENGTH
Reaction-bonded and fiber-reinforced SiC static and dynamic gas turbine components
[BMFT-FB-T-84-302] N85-27874
Fracture toughness of MgCr(sub)2O(sub)4-ZrO(sub)2
[DE85-007945] N85-27982
Preparation of metal for cold upsetting
[BLL-BISI-TRANS-22383-(9022.06)] N85-28043
Measurement of fracture macro-geometry in evaluating fracture toughness
[BLL-BISI-TRANS-22241-(9022.06)] N85-28403
On validity of threshold values of fatigue strength of steel structures
[BLL-BISI-TRANS-22192-(9022.06)] N85-28408

FRACTURING
Structural Integrity and Durability of Reusable Space Propulsion Systems
[NASA-CP-2381] N85-27941
Designing for fiber composite structural durability in hygrothermomechanical environment
[NASA-TM-87045] N85-27978
Part played by non-metallic inclusions during deformation and fracture of steel with different grain sizes
[BLL-BISI-TRANS-22321-(9022.06)] N85-28072
FRAGMENTATION
Frangibility of obstacles at airports
[NLR-MP-84002-U] N85-28431
FRAMES
Spline curves, wire frames and B-value N85-28587
FRANCK-CONDON PRINCIPLE
Measurement of Franck-Condon factors for the v'=0 progression in the B-X system of PO
[AD-A152734] N85-27993
FREDHOLM EQUATIONS
A program for solving first kind Fredholm integral equations by means of regularization
[CWI-NM-R8416] N85-28697
FREE BOUNDARIES
A Navier-Stokes capillary free boundary in open boat crystal growth
[REPT-84-34] N85-28283
FREE CONVECTION
Numerical benchmark study for the finite element computer code NEPTUNE
[DE85-008400] N85-28630
FREE ELECTRON LASERS
Low voltage free electron laser development
[AD-A152917] N85-28342
Resonator optical designs for free electron lasers
[DE85-007678] N85-28347
Report of the Working Group on Other Acceleration Schemes
[DE85-008447] N85-28764
FREE VIBRATION
A study of internal and distributed damping for vibrating turbomachiner blades
[NASA-CR-175901] N85-27868
FREEZING
Fuel freeze point investigations
[AD-A152801] N85-28129
FREQUENCY HOPPING
Measured noise performance of a new method of frequency hopping
[AD-A152679] N85-28234
FREQUENCY MEASUREMENT
Experimental performance of a frequency measurement circuit
[AD-A152951] N85-28239
New time and frequency services at the National Bureau of Standards N85-28289
Methods for optimal recursive estimation of non-stationary time series, applications to atomic time and frequency metrology N85-28312
FREQUENCY SHIFT KEYING
Rational pulse-shaping filters for almost MSK-like modulation
[AD-A153065] N85-28208
FREQUENCY STABILITY
Separating the variances of noise components in the Global Positioning System
[AD-P004578] N85-28295
A new precision time and frequency source for stationary PTTI applications N85-28297
On-orbit frequency stability analysis of the GPS NAVSTAR's 3 and 4 rubidium clocks and NAVSTAR's 5 and 6 cesium clocks N85-28298
Improved master clock reference system at USNO N85-28300
Test results for prototype GPS rubidium clocks N85-28302
Clock characterization tutorial N85-28311
The measurement of linear frequency drift in oscillators N85-28316
High performances from a new design of crystal oscillator N85-28318
Recent results on the peformance of EFOS, NP and NX hydrogen masers N85-28320
Physics element design aspects for a tactical rubidium frequency standard N85-28321
FREQUENCY STANDARDS
New time and frequency services at the National Bureau of Standards N85-28289
Recent improvements in the atomic time scales of the National Bureau of Standards N85-28290
Enhacements to the TTS-502 time transfer system N85-28296
A new precision time and frequency source for stationary PTTI applications N85-28297
Improved master clock reference system at USNO N85-28300
Test results for prototype GPS rubidium clocks N85-28302
Timing-system design considerations for a mobile astrolabe N85-28309
A plan for the development of inertial reconstruction of initial state clock (IRIS) N85-28317
Physics element design aspects for a tactical rubidium frequency standard N85-28321
The superconducting cavity stability ruby maser oscillator N85-28324
FREQUENCY SYNCHRONIZATION
Timing accuracy of LF and TV synchronization techniques N85-28288
The role of a low Earth orbiter in intercontinental time synchronization via GPS satellites N85-28306
FRESNEL LENSES
Development of a second-generation linear Fresnel Photovoltaic and Thermal (PVT) concentrator array, including fabrication and installation of a 200 square meter collector field
[DE85-008473] N85-28465
DOE/Sandia point-focus concentrator program, draft
[DE85-008209] N85-28793
FRICTION
Friction and wear behavior of aluminum and composite I-beam stiffened airplane skins
[NASA-TM-86418] N85-27852
FRICTION DRAG
Calculation of friction at spherical bearing journals in turbomachines N85-28150
FRICTION REDUCTION
Lubricant and additive effects on spur gear fatigue life
[NASA-TM-87044] N85-28373
Tribological sinks: Money down the drain
[DE85-010019] N85-28376
FRINGE MULTIPLICATION
Measurement of ultrasonic fields in transparent media using a scanning differential interferometer
[NASA-CR-175921] N85-28726
FRONTS (METEOROLOGY)
Statistical interpretation of the ECMWF model using MOS to predict surface wind and temperature
[WSR-2] N85-28515
Automatic detection of gust fronts
[FAA/PM-85-11] N85-28516
FUEL CELLS
Molten carbonate fuel cell performance model update
[DE85-003356] N85-28454
FUEL GAGES
Assessment study of liquid content measurement methods applicable to space missions --- Infrared Space Observatory
[TU-HH-TRI-ESA-84-2] N85-28135
FUEL INJECTION
Segmented zoned fuel injection system for use with a combustor
[AD-D011640] N85-27865
FUEL PRODUCTION
Conversion of methanol to gasoline: Engineering and construction of the demonstration plant
[DE85-003237] N85-28133
FUEL TANKS
Fuel freeze point investigations
[AD-A152801] N85-28129
FUEL-AIR RATIO
Detailed chemical kinetic study of the effect of molecular structure on autoignition of fuel-air mixtures
[DE85-004424] N85-28010
FUELS
Evaluation of used crankcase oils using computerized infrared spectrometry
[AD-A152993] N85-27999
Alcohol Fuels Program technical review, spring 1984
[DE85-002919] N85-28134
Urban vehicle research project
[DE85-005444] N85-28889
FUNCTIONAL DESIGN SPECIFICATIONS
SC filters and design centering of integrated circuits. Part 2: Design centering of integrated circuits
[BMFT-FB-T-84-265-PT-2] N85-28257
FUNCTIONALS
The role of duality in optimization problems involving entropy functionals, with applications to information theory
[AD-A152336] N85-28713
FUNCTIONS
DLA: Data/data base administration analysis
[AD-A153031] N85-28879
FUNCTIONS (MATHEMATICS)
Convergence of Newton's method for a single real equation
[NASA-TP-2489] N85-28656
FURNACES
Study of a constricted electric arc cooled by transpiration
[NASA-TM-77846] N85-28796
FUSELAGES
Development of a fuselage forward section in Carbon Fiber Reinforced Plastic (CFRP) type of construction
[MBB/LFA34/CFK/PUB/008] N85-27851
FUSION REACTORS
Heavy ion fusion accelerator research in the US
[DE85-006465] N85-28767
An Impurity Control Test Facility (ICTF) for the study of fusion reactor/plasma edge materials
[DE85-007946] N85-28810
Radiation damage experiments and lifetime estimates for beryllium components in fusion systems
[DE85-006038] N85-28811
Two-dimensional TBR calculations for conceptual compact reversed-field pinch reactor blanket
[DE85-007636] N85-28812
FUZZY SETS
Fuzzy hierarchical analysis
[DE85-008149] N85-28685

G

GALACTIC ROTATION
The study of the physics of cometary nuclei
[NASA-CR-175917] N85-28905
GALERKIN METHOD
A study of internal and distributed damping for vibrating turbomachiner blades
[NASA-CR-175901] N85-27868
A fast implementation of explicit time stepping algorithms with the finite element method for a class of nonlinear evolution problems
[REPT-84-03] N85-28686
GALLIUM ARSENIDES
Random access memory technologies
[AD-A153089] N85-28597
Optical waveguide characterization using grating couplers
[AD-A153063] N85-28789
Activities of the Solid State Physics Research Institute
[NASA-CR-175899] N85-28818
Leakage effects in n-GaAs MESFET with n-GaAs buffer layer N85-28826
GaAs MESFET with lateral non-uniform doping N85-28827
Materials-process interactions in ternary alloy semiconductors
[AD-A153133] N85-28832
GAME THEORY
A formal analysis of the evolution of cooperation
[AD-A152539] N85-28662
GAMMA RAY SPECTRA
A 200-MeV pi(+) induced nucleon removal from 24Mg N85-28821
GAMMA RAYS
Results from radiation monitoring equipment experiment on STS-11
[AD-A152531] N85-27932
Measurement and interpretation of electron angle at MABE beam stop
[DE85-008583] N85-28755
Incorporation of Monte Carlo electron interface studies into photon general cavity theory
[DE85-007674] N85-28772
High energy gamma rays from complex particle collisions
[DE85-007871] N85-28783
Results from radiation monitoring equipment experiment on STS-8
[AD-A153241] N85-28911
GAS CHROMATOGRAPHY
An ultrasensitive and element specific photoionization detection system for environmental analysis
[AD-A153365] N85-28332
GAS DISCHARGE TUBES
Process for making electrodes for discharge tubes
[DE85-008898] N85-28247
GAS DISCHARGES
The decomposition of gas phase formaldehyde by plasma discharge
[AD-A153202] N85-28007
GAS EXCHANGE
Photosynthetic acclimation of Acer saccharum
[DE85-008247] N85-28536
GAS FLOW
Calculation of viscous compressible flows in small gas turbines N85-27950
Flow characteristics of a partially submerged liquid pickup
[DE85-008744] N85-28276

GAS JETS
Uniaxial angular accelerometers N85-28173
GAS LASERS
Photochemical ignition studies. 1: Laser ignition of flowing premixed gases
[AD-A153048] N85-28002
GAS PRESSURE
The loss of material from the cathode of metal arcs
[NASA-TM-77845] N85-27985
GAS STREAMS
Method of calculating separation flow of subsonic gas stream around wings N85-28161
GAS TURBINE ENGINES
Structural tailoring of SSME blades (vanes) N85-27960
An investigation into the soot production processes in a gas turbine engine
[AD-A152710] N85-27992
Ceramic applications in turbine engines
[NASA-CR-174715] N85-28109
Report to Congress on the Automotive Technology Development Program
[DE85-005640] N85-28890
GAS TURBINES
Future fundamental combustion research for aeropropulsion systems
[NASA-TM-87049] N85-27870
Reaction-bonded and fiber-reinforced SiC static and dynamic gas turbine components
[BMFT-FB-T-84-302] N85-27874
Detailed chemical kinetic study of the effect of molecular structure on autoignition of fuel-air mixtures
[DE85-004424] N85-28010
Development of high temperature resistant, noncorroeible, non-metallic ceramic materials, especially silicon nitride in gas turbine application
[BMFT-FB-T-85-015] N85-28125
Development of high temperature resistant noncorrodible silicon carbide components for gas turbine applications, follow-up report
[BMFT-FB-T-85-016] N85-28126
Precision die forging of blades or gas turbines N85-28146
Stressed-strained state of tightening buckles in sectional runners of gas turbines N85-28149
GAS-METAL INTERACTIONS
Hot Isostatic Pressing (HIP): Techniques, applications and economical use
[JUEL-SPEZ-288] N85-28141
GASIFICATION
Alcohol Fuels Program technical review, spring 1984
[DE85-002919] N85-28134
GASOLINE
Conversion of methanol to gasoline: Engineering and construction of the demonstration plant
[DE85-003237] N85-28133
GAUSS EQUATION
Special relativity of Kaluza-Klein
[DE85-007838] N85-28847
GEARS
Study of a test method for assessing machinability in gear cutting operations
[BLL-BISI-TRANS-22345-(9022.06)] N85-28359
Assessing the machinability of gearwheel steels during manufacture
[BLL-BISI-TRANS-22343-(9902.06)] N85-28365
Multi-mesh gear dynamics program evaluation and enhancements
[NASA-CR-174747] N85-28372
Lubricant and additive effects on spur gear fatigue life
[NASA-TM-87044] N85-28373
GEODESY
Water vapor radiometry research and development phase
[NASA-CR-175867] N85-28512
GEOLOGICAL SURVEYS
Interpretation of the data of USGS seismic refraction profile across the Arabian Shield in western Saudi Arabia N85-28488
GEOMETRIC RECTIFICATION (IMAGERY)
Looking at more than three dimensions
[DE85-007764] N85-28600
GEOMETRICAL OPTICS
Performance evaluation of fiber-optic converters N85-28154
Optical phenomena in computer vision
[AD-A152970] N85-28595
GEOMETRY
Probabilistic structural analysis of SSME turbopump blades: Probabilistic geometry effects N85-27958
Computational Geometry and Computer-Aided Design
[NASA-CP-2379] N85-28563
Multivariate spline algorithms for CAGD N85-28566
Improving the effectiveness of integral property calculation in a CSG solid modeling system by exploiting predictability N85-28586
GEOPHYSICS
Yearbook of the Bureau of Mineral Resources, Geology and Physics: Geoscientific research, resource assessment, and database development, 1 Jul. 1983 to 30 Jun. 1984
[BMR-84] N85-28474
Geophysical plasmas and atmospheric modeling
[AD-A152805] N85-28497
GEOTHERMAL ENERGY CONVERSION
Silica problem in the design of geothermal power plants
[DE85-008245] N85-28453
GEOTHERMAL RESOURCES
Navy geothermal plan
[AD-A152478] N85-28450
GEOTHERMAL TECHNOLOGY
Alternative heat sources for heat pumps
[DE85-007610] N85-28275
GLACIERS
Modern sedimentation in the northern Barents Sea: Input, dispersal and deposition of suspended sediments from glacial meltwater
[AD-A152520] N85-28530
GLASS
Investigation of charge transport in the thermoelectret state of some ceramics and glasses
[DE85-009318] N85-28122
Investigation of semiconductor clad optical waveguides
[NASA-CR-175870] N85-28785
GLASS FIBER REINFORCED PLASTICS
Finland, Sweden cooperate in composites research N85-28184
GLASSY CARBON
Glassy metals: New highly resistant material
[BLL-BISI-TRANS-21764-(9022.06)] N85-28049
GLIDERS
Three powered sailplanes as meteorological instrumentation for atmospheric boundary layer studies at DFVLR
[DFVLR-FB-84-50] N85-27862
Proposals for the determination of necessary elevator handling characteristics of sailplanes in high speed range
[DFVLR-FB-84-52] N85-27882
GLOBAL POSITIONING SYSTEM
Real-time position determinations using the GPS TI4100/GEOSTAR receiver
[AD-A152551] N85-27845
Proceedings of the Fifteenth Annual Precise Time and Time Interval (PTTI) Applications and Planning Meeting
[AD-A149163] N85-28287
International time comparison by a GPS timing receiver N85-28293
First results of GPS time transfer to Australia N85-28294
Separating the variances of noise components in the Global Positioning System
[AD-P004578] N85-28295
Enhacements to the TTS-502 time transfer system N85-28296
On-orbit frequency stability analysis of the GPS NAVSTAR's 3 and 4 rubidium clocks and NAVSTAR's 5 and 6 cesium clocks N85-28298
CPS navigation experiment using high precision GPS timing receivers N85-28299
The steering of GPS time N85-28301
Test results for prototype GPS rubidium clocks N85-28302
International time transfer and portable clock evaluation using GPS timing receivers: Preliminary results N85-28303
Unattended TV time transfer results N85-28305
The role of a low Earth orbiter in intercontinental time synchronization via GPS satellites N85-28306
GLOBAL TRACKING NETWORK
CPS navigation experiment using high precision GPS timing receivers N85-28299
GOVERNMENTS
A 5-year research plan, 1985-1990. Wind energy technology: Generating power from the wind
[DE85-008427] N85-28463
GRADIENTS
Alternating gradient synchrotron
[DE85-005950] N85-28759
GRAIN BOUNDARIES
Electrons and grain boundary energies in metals
[DE85-009530] N85-28099
GRAIN SIZE
Mechanical stabilization of austenite against epsilon martensite and its effect on deformation behavior in high manganese steels
[DE85-007654] N85-28097
GRAMMARS
Language design, computers and brains
[AD-A152819] N85-28594
GRAPHITE
Effects of the cooling rate on the structure of the graphite in inoculated irons
[BLL-BISI-TRANS-22305-(9022.06)] N85-28083
A micrographic and gravimetric study of intercalation and deintercalation of graphite fibers
[NASA-TM-87026] N85-28110
Bifunctional oxygen electrodes
[DE85-006871] N85-28248
GRATINGS (SPECTRA)
Optical waveguide characterization using grating couplers
[AD-A153063] N85-28789
GRAVIMETRY
A micrographic and gravimetric study of intercalation and deintercalation of graphite fibers
[NASA-TM-87026] N85-28110
GRAVITATION
Fluid surface behavior in low gravity. Center discretionary fund no. 83-21
[NASA-TP-2486] N85-28260
GRINDING (MATERIAL REMOVAL)
Study of a test method for assessing machinability in gear cutting operations
[BLL-BISI-TRANS-22345-(9022.06)] N85-28359
GROUND RESONANCE
Aerodynamic performance of a wing in ground effect using the PANAIR program
[AD-A153303] N85-27832
GROUP DYNAMICS
Individual characteristics and unit performance: A review of research and methods
[AD-A153145] N85-28550
The impact of group processing on achievement in cooperative learning groups
[AD-A153168] N85-28551
Oral discussion, group-to-individual transfer and achievement in cooperative learning groups
[AD-A153209] N85-28552
The effects of controversy and concurrence seeking on effective decision making
[AD-A153370] N85-28555
GROWTH
Numerical estimation of the curvature of biological surfaces N85-28588
GUIDE VANES
Spacer structure
[AD-D011641] N85-27866
GUN PROPELLANTS
Liquid propellants for use in guns: A review
[AD-A153051] N85-28131
GUNS (ORDNANCE)
Liquid propellants for use in guns: A review
[AD-A153051] N85-28131
GUST ALLEVIATORS
OLGA: An open loop gust alleviation system N85-27897
GUST LOADS
Identification of gust input and gust response characteristics from Do 28 TNT flight test data
[DFVLR-FB-84-48] N85-27881
OLGA: An open loop gust alleviation system N85-27897
GUSTS
The gust simulation apparatus of the 3m x 3m low speed wind tunnel of the DFVLR in Goettingen, West Germany
[DFVLR-FB-85-04] N85-27920
Automatic detection of gust fronts
[FAA/PM-85-11] N85-28516
GYRO HORIZONS
Perception of roll rate from an artificial horizon and peripheral displays
[VTH-LR-403] N85-28557
GYROCOMPASSES
Simulation of gyrocompassing alignment and calibration of strapdown inertial navigation system in a swaying vehicle
[DFVLR-MITT-84-20] N85-27850

H

HALF SPACES
Interaction among inhomogeneities and inclusions
[AD-A153114] N85-28419
HALL EFFECT
High temperature position sensors based on monolithic GaAs Hall IC
[BMFT-FB-T-84-266] N85-28337
Activities of the Solid State Physics Research Institute
[NASA-CR-175899] N85-28818
Hall mobility in fluid argon
[DE85-007288] N85-28840

HAND (ANATOMY)
Hand controllers for teleoperation. A state-of-the-art technology survey and evaluation
[NASA-CR-175890] N85-28559
HANDBOOKS
The GfW handbook for data compilation of irradiation tested electronic components, volume 3
[HMI-B-353-VOL-3] N85-28258
Handbook on superconductivity: The large-scale applications. Chapter 4
[DE85-008170] N85-28838
HANG GLIDERS
An assessment of the suitability of the BHGA structural test rig for aerodynamic testing of hang gliders
[CA-8505] N85-27853
HARDENING
Influence of heat treatment parameters on the properties of induction hardened Ni-Cr-Mo steels
[BLL-BISI-TRANS-2499-(9022.06)] N85-28053
HARDENING (MATERIALS)
Heat resistant Carbon Fiber Reinforced Plastics (CFRP) hardening equipment
[MBB/LFA33/CFK/PUB/007] N85-27976
X-ray crystallography of steel U8 after pulsed laser hardening
[BLL-BISI-22444-(9022.06)] N85-28038
HARDWARE
Shuttle-tethered satellite system definition study extension
[NASA-CR-171473] N85-27923
Hardware test program for evaluation of baseline range/range rate sensor concept
[NASA-CR-175910] N85-28194
Synchronization and fault-masking in redundant real-time systems
[NASA-TM-87478] N85-28644
HARMONIC CONTROL
Data processing on the rotor test stand at DFVLR in Brunswick: Microprogrammable interfaces and array processor as key components in a PDP 11 real time data acquisition and processing system
[DFVLR-MITT-85-03] N85-27921
HARMONIC OSCILLATION
Analysis of unsteady pressure measurements on a supercritical airfoil with a harmonically oscillating trailing edge flap at subsonic and transonic speeds
[DFVLR-FB-84-49] N85-27837
HEAO
Optical observations of HEAO-B objects N85-28895
HEAT
Correlation of zeolite ZSM-5 acid strength with catalytic activity and selectivity
[DE85-005415] N85-28013
HEAT BALANCE
Heating parameter estimation using coaxial thermocouple gages in wind tunnel test articles
[AD-A153039] N85-28328
HEAT CAPACITY MAPPING MISSION
Comparison of measurement and simulation results of radiation temperatures applied to the thermal mapping of Munich
[DFVLR-FB-85-06] N85-28442
HEAT EXCHANGERS
DOE/ANL/HTRI heat exchanger tube vibration data bank: Addendum 5
[DE85-007730] N85-28425
HEAT FLUX
Experimental measurements and analysis of heat transfer and gas dynamics in a rotating turbine stage N85-27949
Heat flux sensor calibrator N85-27970
Conformational and mechanical properties at high strain rates
[AD-A153401] N85-28272
HEAT MEASUREMENT
Heat flux sensor calibrator N85-27970
HEAT PIPES
Heat pipe and method of making same
[AD-D011654] N85-28273
HEAT PUMPS
Alternative heat sources for heat pumps
[DE85-007610] N85-28275
Simplified analysis of Stirling engines and heat pumps
[DE85-008753] N85-28457
HEAT RESISTANT ALLOYS
Effects of high mean stress on high-cycle fatigue behavior of PWA 1480 N85-27964
Constitutive cyclic deformation behavior in single-crystal and directionally solidified SSME high-pressure fuel turbopump airfoil materials N85-27965
High-thermal-gradient superalloy crystal growth N85-27966
Role of hydrogen and structure on CMSX-2 N85-27967
The characteristic structure of weld metal of high temperature alloy X20CrMoV 121
[BLL-BISI-TRANS-21623-(9022.06)] N85-28069
Precision die forging of blades or gas turbines N85-28148
HEAT SHIELDING
Erosion of corrosion-resistant surface treatments on alloy steels
[DE85-008446] N85-28100
HEAT STORAGE
High temperature composite thermal storage systems
[DE85-005073] N85-28455
Performance of an active/passive hybrid solar system utilizing vapor transport
[DE85-008627] N85-28466
HEAT TRANSFER
Future fundamental combustion research for aeropropulsion systems
[NASA-TM-87049] N85-27870
Investigation of heat transfer to a turbine blade cascade using a shock tube
[AD-A153090] N85-27871
Overview of aerothermodynamic loads definition study N85-27942
Fuel freeze point investigations
[AD-A152801] N85-28129
Stefan-Maxwell relations for plasma diffusion currents in magnetic field N85-28160
FLOWPLOT 2: A fluid dynamics and heat transfer plotting package
[DE85-009802] N85-28277
Heating parameter estimation using coaxial thermocouple gages in wind tunnel test articles
[AD-A153039] N85-28328
Experimental and theoretical studies on transport processes in laser welding
[DE84-008572] N85-28378
Simplified analysis of Stirling engines and heat pumps
[DE85-008753] N85-28457
Performance of an active/passive hybrid solar system utilizing vapor transport
[DE85-008627] N85-28466
TRINITY: A pre- and post-processing program for 2-dimensional finite element data
[DE85-008029] N85-28628
Large, energetic cluster impacts on surfaces
[DE85-006559] N85-28769
Handbook on superconductivity: The large-scale applications. Chapter 4
[DE85-008170] N85-28838
HEAT TREATMENT
Thermodynamic analysis of the plasma nitriding of ferrovanadium
[BLL-BISI-TRANS-22237-(9022.06)] N85-28032
Thermomechanical softening treatment for bearing and tool steels
[BLL-BISI-TRANS-22432-(9022.06)] N85-28035
Improving the properties of copper and copper alloys through heat treatment and alloying
[BLL-BISI-TRANS-21939-(9022.06)] N85-28047
The state of martensite after quenching in a magnetic field
[BLL-BISI-TRANS-22297-(9022.06)] N85-28051
Influence of heat treatment parameters on the properties of induction hardened Ni-Cr-Mo steels
[BLL-BISI-TRANS-2499-(9022.06)] N85-28053
Textural transformations taking place during heat and mechanical treatment in triplex steels
[BLL-BISI-TRANS-22404-(9022.06)] N85-28063
Effects of the phase compositions of cast low-pearlite steels micro-alloyed with vanadium and titanium of their structure and properties
[BLL-BISI-TRANS-22301-(9022.06)] N85-28067
Technological apparatus for laser treatment of materials N85-28174
Local heat treatment of welded joints of pipes and rotary vessels
[BLL-BISI-TRANS-22197-(9022.06)] N85-28354
Technical information: Weldability of stainless steel. Part 1: Austenitic stainless steel
[BLL-BISI-TRANS-22456-(9022.06)] N85-28362
Effects of the structural state in thermo-bimetals on their resistance to microscopic plastic deformation
[BLL-BISI-TRANS-22403-(9022.06)] N85-28412
Plasma processing of materials
[AD-A152398] N85-28800
HEATERS
Heat resistant sheathed insulated electrical conductors
[AD-D011644] N85-28219
HEAVY IONS
Nonrelativistic theory of heavy-ion collisions
[DE85-007538] N85-28747
Experiments and detectors for high energy heavy ion colliders
[DE85-007927] N85-28748
Spin distributions in heavy ion fusion at and below the Coulomb barrier
[DE85-007817] N85-28751
Theoretical studies of heavy ion scattering processes
[DE85-008823] N85-28753
Heavy ion physics at BNL, the AGS and RHIC
[DE85-005951] N85-28760
Heavy ion fusion accelerator research in the US
[DE85-008485] N85-28767
HEAVY NUCLEI
Heavy ion physics at BNL, the AGS and RHIC
[DE85-005951] N85-28760
HEISENBERG THEORY
Lattice actions improved by block-spin renormalisation group and maximally symmetric lattices
[DE85-007416] N85-28841
HELICOPTER CONTROL
A preliminary investigation of handling qualities requirements for helicopter instrument flight during decelerating approach maneuvers and overshoot
[NRC-24173] N85-27857
The evolution of ACS for helicopters: Conceptual simulation studies to preliminary design N85-27890
ACT applied to helicopter flight control N85-27891
The evolution of active control technology systems for the 1990's helicopter N85-27911
Data processing on the rotor test stand at DFVLR in Brunswick: Microprogrammable interfaces and array processor as key components in a PDP 11 real time data acquisition and processing system
[DFVLR-MITT-85-03] N85-27921
HELICOPTER TAIL ROTORS
Rotorcraft research testing in the National Full-Scale Aerodynamics Complex at NASA Ames Research Center
[NASA-TM-86687] N85-27854
HELICOPTERS
Investigation of imaging and flight guidance concepts for rotorcraft zero visibility approach and landing
[NASA-CR-166571] N85-27843
HELIOS 1
Solar wind observations associated with a slow forward shock wave at 0.31 AU
[MPAE-W-79-84-46] N85-28909
HELMHOLTZ VORTICITY EQUATION
An introduction to vortex breakdown and vortex core bursting
[NAE-AN-28] N85-27829
HERMITIAN POLYNOMIAL
Montonicity preserving bicubic interpolation, revision 1
[DE85-007976] N85-28683
HESSIAN MATRICES
Software for estimating sparse Hessian matrices
[DE85-008121] N85-28629
HETEROGENEITY
Quality testing to the specifications of the Stahl-Eisen-Pruefblatt 1570/71 using an automatic image analysis system
[BLL-BISI-TRANS-22253-(9022.06)] N85-28385
HETEROJUNCTIONS
The construction and study of improved Al(x)Ga(1-x)As-GaAs heterostructure devices
[AD-A153264] N85-28244
HEURISTIC METHODS
Identifying solution paths in cognitive diagnosis
[AD-A152463] N85-28549
HF LASERS
Operating characteristics, absorptivity/reflectivity measurements, and pulse system design of the NPS (Naval Postgraduate School) hydrogen fluoride/deuterium fluoride laser
[AD-A152712] N85-28341
HIERARCHIES
Fuzzy hierarchical analysis
[DE85-008149] N85-28685
HIGH ALTITUDE ENVIRONMENTS
High-altitude testing of selective optical coatings for solar radiators and collectors N85-28143
HIGH ALTITUDE TESTS
High-altitude testing of selective optical coatings for solar radiators and collectors N85-28143
HIGH ENERGY INTERACTIONS
USSR report: Engineering and equipment
[JPRS-UEQ-85-004] N85-28142
Neutron scattering and reactions on 59Co from 1 to 20 MeV
[AERE-R-11439] N85-28729
Heavy ion physics at BNL, the AGS and RHIC
[DE85-005951] N85-28760
Particle physics: Recent successes and future prospects
[DE85-008175] N85-28765
Activities report in nuclear physics and high energy physics
[JF40026] N85-28777

Physics of (very) high energy e(+)-e(-) colliders
[DE85-008177] N85-28780
Theoretical studies of high energy phenomenon: Analysis of models of CP and T violation
[DE85-007455] N85-28782

HIGH GAIN
Instabilities and chaotic behavior of active and passive laser systems
[AD-A153366] N85-28346

HIGH LEVEL LANGUAGES
Multicomputer operating systems and applications
[AD-A153205] N85-28648

HIGH PRESSURE
Combustion and micro-explosion of water/oil emulsions in high pressure environments
[AD-A152960] N85-27997
Steel Tubes
[BLL-BISI-TRANS-22064-(9022.06)] N85-28369
Principal quality assurance measures in the manufacture of HF-welded high-pressure linepipe
[BLL-BISI-TRANS-21690-(9022.06)] N85-28389

HIGH RESISTANCE
Properties of nitrogen containing stainless alloy designed for high resistance to pitting
[DE85-008282] N85-28095

HIGH RESOLUTION
High resolution powder diffraction
[DE85-008287] N85-28015

HIGH STRENGTH ALLOYS
Corrosion test on high-alloy steels
[BLL-BISI-TRANS-21627-(9022.06)] N85-28046

HIGH STRENGTH STEELS
High-strength weldable steel 03G4N2MAF Sh with improved ductility
[BLL-BISI-TRANS-22233-(9022.06)] N85-28031
Corrosion test on high-alloy steels
[BLL-BISI-TRANS-21627-(9022.06)] N85-28046
Effect of texture in steel on the susceptibility of hydrogen embrittlement
[BLL-BISI-TRANS-22026-(9022.06)] N85-28048
Influence of preliminary cold deformation on fineness of pearlite
[BLL-BISI-TRANS-22409-(9022.06)] N85-28054
Hydrogen embrittlement of high-strength steel
[B8580075] N85-28103
Fatigue crack propagation characteristics and fatigue fracture toughness in 780 MPa grade high strength steel weldments at low temperature
[BLL-BISI-TRANS-22369-(9022.06)] N85-28411

HIGH TEMPERATURE
Strength and failure analysis of composite laminates with holes at room and elevated temperatures
[AD-A153263] N85-27981
Improving the properties of copper and copper alloys through heat treatment and alloying
[BLL-BISI-TRANS-21939-(9022.06)] N85-28047
Powder-metallurgy alloys and steels
[BLL-BISI-TRANS-22239-(9022.06)] N85-28050
The characteristic structure of weld metal of high temperature alloy X20CrMoV 121
[BLL-BISI-TRANS-21623-(9022.06)] N85-28069
Influence of eutectic silicate inclusions on micro-processes during deformation and fracture of 12GS steel
[BLL-BISI-TRANS-22296-(9022.06)] N85-28073
Overload effects on sustained load crack growth at elevated temperature
[AD-A153223] N85-28091
Electrodes for flash discharge lamps
[DE85-006897] N85-28250
Evaluation of interpolative modeling concepts for fatigue crack growth at elevated temperature
[AD-A153222] N85-28422
Average collisional vibrational energy transfer quantities and the inversion temperature
[AD-A152674] N85-28733

HIGH TEMPERATURE GASES
Influence of thermochemical treatment on properties of low-carbon steel
[BLL-BISI-TRANS-22410-(9022.06)] N85-28055

HIGH TEMPERATURE TESTS
Influence of thermochemical treatment on properties of low-carbon steel
[BLL-BISI-TRANS-22410-(9022.06)] N85-28055

HIGH VOLTAGES
Further development of high voltage SIPMOS FET's to fulfil market needs
[BMFT-FB-T-84-255] N85-28843

HISTORIES
The revolution in military affairs and the Soviet system
[AD-P004568] N85-28863

HOLOGRAPHIC SPECTROSCOPY
Holographic corrector in objective with compound main mirror N85-28153

HOLOGRAPHY
Holographic intensity correlator with PRIS-type photoelectro-optical controlled transparency N85-28152
Holographic corrector in objective with compound main mirror N85-28153
Morphological stability and fluid dynamics of vapor crystal growth
[NASA-CR-175879] N85-28822

HORIZONTAL SPACECRAFT LANDING
Active control technology experience with the Space Shuttle in the landing regime N85-27900

HOT PRESSING
Development of high temperature resistant, noncorrosible, non-metallic ceramic materials, especially silicon nitride in gas turbine application
[BMFT-FB-T-85-015] N85-28125
Development of high temperature resistant noncorrodible silicon carbide components for gas turbine applications, follow-up report
[BMFT-FB-T-85-016] N85-28126
Hot Isostatic Pressing (HIP): Techniques, applications and economical use
[JUEL-SPEZ-288] N85-28141

HUMAN BEHAVIOR
Identifying solution paths in cognitive diagnosis
[AD-A152463] N85-28549
Individual characteristics and unit performance: A review of research and methods
[AD-A153145] N85-28550
A formal analysis of the evolution of cooperation
[AD-A152539] N85-28662
European Science Notes, Volume 39, Number 3
[AD-A152446] N85-28717
Verbal information processing paradigms: A review of theory and methods
[AD-A153229] N85-28880

HUMAN FACTORS ENGINEERING
Space Station crew safety alternatives study. Volume 5: Space Station safety plan
[NASA-CR-3858] N85-27930
Robotic safety systems and methods: Savannah River site
[DE85-008261] N85-28375
Hand controllers for teleoperation. A state-of-the-art technology survey and evaluation
[NASA-CR-175890] N85-28559
Mechanizing of handling operations in drop forging with hammers and presses (conducted ergonomical examinations)
[BMFT-FB-HA-84-051] N85-28561

HUMAN PERFORMANCE
Sleep deprivation and performance: Older age performance and limited sleep period use
[AD-A153102] N85-28540
Performance Evaluation Tests for Environmental Research (PETER) evaluation of 112 measures
[AD-A152317] N85-28543
The levels of processing conceptualization of human memory: Some empirical and theoretical issues
[AD-A152321] N85-28544
The relationship between performance and satisfaction: A utility analysis
[AD-A152342] N85-28546
Individual characteristics and unit performance: A review of research and methods
[AD-A153145] N85-28550
Biofeedback and performance: An update
[AD-A153228] N85-28553

HUMAN REACTIONS
Predictors of transfer adjustment: A longitudinal study
[AD-A152462] N85-28548

HUMIDITY
Proper quality of anticorrosion work no matter how bad the atmospheric conditions
[BLL-BISI-TRANS-22080-(9022.06)] N85-28383

HUMIDITY MEASUREMENT
Technology development for thin-film-trace humidity sensors
[BMFT-FB-T-84-268] N85-28338

HURRICANES
Airborne research meteorological data collected by the National Hurricane Research Laboratory (Hurricane Research Division/AOML) during the 1982-1983 hurricane seasons: Inventory and availability
[PB85-163681] N85-28528

HYBRID STRUCTURES
Elastic equilibrium of composite shells with finite shear rigidity N85-28163

HYDRAULIC EQUIPMENT
Active control landing gear for ground load alleviation N85-27902

HYDRAZINE ENGINES
Heat resistant sheathed insulated electrical conductors
[AD-D011644] N85-28219

HYDROCARBONS
Systematic nomenclature of the nitrogen, oxygen and sulfur functional polycyclic aromatic hydrocarbons
[DE85-007426] N85-27974

HYDRODYNAMICS
Catalyst and reactor development for a liquid phase Fischer-Tropsch process
[DE85-005894] N85-28014
A discussion of adaptive grids and their applicability in numerical hydrodynamic modeling
[AD-A151843] N85-28659
A numerical solution technique for multitemperature plasma hydrodynamics
[AD-A152701] N85-28801

HYDROFLUORIC ACID
Rotational relaxation studies of hydrogen fluoride
[AD-A152711] N85-28734

HYDROGEN
Role of hydrogen and structure on CMSX-2 N85-27967
Photoionization mass spectrometry with VUV hydrogen laser source
[AD-A153362] N85-28009
Effect of texture in steel on the susceptibility of hydrogen embrittlement
[BLL-BISI-TRANS-22026-(9022.06)] N85-28048
Construction techniques of a molecular hydrogen laser
[AD-A152928] N85-28343
Thermodynamic calculations of equilibrium states in metal-carbon-hydrogen-oxygen system
[BLL-BISI-TRANS-22092-(9022.06)] N85-28844

HYDROGEN EMBRITTLEMENT
Study to optimize Cr-Mo steels to resist hydrogen and temper embrittlement
[DE85-005492] N85-28096
Hydrogen degradation of pipeline steels
[DE85-008930] N85-28101
Hydrogen embrittlement of high-strength steel
[B8580075] N85-28103

HYDROGEN MASERS
Proceedings of the Fifteenth Annual Precise Time and Time Interval (PTTI) Applications and Planning Meeting
[AD-A149163] N85-28287
First results of GPS time transfer to Australia N85-28294
Improved master clock reference system at USNO N85-28300
Recent results on the peformance of EFOS, NP and NX hydrogen masers N85-28320

HYDROGEN PEROXIDE
Oxygen isotopic study of the oxidation of SO2 by H2O2 in the atmosphere
[DE85-004017] N85-28468

HYDROLOGY
Potential climatic impacts of increasing atmospheric CO2 with emphasis on water availability and hydrology in the United States
[NASA-TM-87479] N85-28517

HYDROLYSIS
Kinetics of hydrolysis and products of hydrolysis and photolysis of tetryl
[AD-A153144] N85-28005
Model for the growth of fractal silica polymers
[DE85-007884] N85-28115

HYDROSTATICS
On Long's solution to hydrostatic flow over mountains
[DFVLR-MITT-84-02] N85-28503

HYDROTHERMAL STRESS ANALYSIS
Designing for fiber composite structural durability in hygrothermomechanical environment
[NASA-TM-87045] N85-27978

HYGRAL PROPERTIES
Designing for fiber composite structural durability in hygrothermomechanical environment
[NASA-TM-87045] N85-27978

HYPERBOLAS
Efficient parallel solution of linear systems with hyperbolic rotations
[AD-A152355] N85-28661

HYPERBOLIC DIFFERENTIAL EQUATIONS
Relaxation methods for hyperbolic equations
[REPT-84-20] N85-28687

HYPERGEOMETRIC FUNCTIONS
Asymptotic expansion of Jacobi polynomials
[REPT-84-35] N85-28689

HYPERSONIC BOUNDARY LAYER
Proceedings of the 9th US Air Force and the Federal Republic of Germany Data Exchange Agreement Meeting, Viscous and Interacting Flow Field Effects
[AD-A153020] N85-28266

I

I BEAMS
Buckling and bracing of cantilevers
[CE-42] N85-28413

ICE FORMATION
Ice shapes and the resulting drag increase for a NACA 0012 airfoil
[NASA-TM-83556] N85-27839

IGNITION
Elementary reactions of importance in oxidation, combustion ignition and flame inhibitions
[AD-A153139] N85-28004

IMAGE CONTRAST
Alphabet-constrained data compression
[AD-A152887] N85-28667

IMAGE ENHANCEMENT
Looking at more than three dimensions
[DE85-007764] N85-28600

IMAGE INTENSIFIERS
Holographic intensity correlator with PRIS-type photoelectro-optical controlled transparency N85-28152

IMAGE PROCESSING
Free-surface phenomena under low- and zero-gravity conditions
[NASA-CR-175885] N85-27922
Techniques for operating Charge Coupled Devices (CCD's) in very high speed framing mode
[AD-A152878] N85-28236
Sub-nanosecond cinematography in laser fusion research: Current techniques and applications at the Lawrence Livermore Laboratory
[DE85-007252] N85-28334
Evidential reasoning in expert systems for image analysis
[AD-A153379] N85-28627
Application of artificial intelligence (AI) to radar image understanding
[AD-A152519] N85-28654
Deconvolution methods for multi-sensors
[AD-A152351] N85-28660
Further study of digital matching of dissimilar images
[AD-A153112] N85-28672
Spatial light modulator having a capacitively coupled photoconductor
[AD-D011646] N85-28790

IMAGE RECONSTRUCTION
Holographic intensity correlator with PRIS-type photoelectro-optical controlled transparency N85-28152
Deconvolution methods for multi-sensors
[AD-A152351] N85-28660

IMAGE RESOLUTION
Holographic intensity correlator with PRIS-type photoelectro-optical controlled transparency N85-28152

IMAGE TRANSDUCERS
Construction and analysis of a PRIZ spatial light modulator exhibiting dynamic image selection
[AD-A152318] N85-28787

IMAGERY
An assessment of the potential role of multispectral imagery in bathymetric charting
[AD-A152460] N85-28438

IMAGES
Further study of digital matching of dissimilar images
[AD-A153112] N85-28672
System of white-light density pseudocolor encoding with three primary colors
[AD-D011651] N85-28791

IMAGING TECHNIQUES
Holographic intensity correlator with PRIS-type photoelectro-optical controlled transparency N85-28152
Techniques for operating Charge Coupled Devices (CCD's) in very high speed framing mode
[AD-A152878] N85-28236
Generation and display apparatus
[AD-D011639] N85-28599
System of white-light density pseudocolor encoding with three primary colors
[AD-D011651] N85-28791

IMPACT STRENGTH
High-strength weldable steel 03G4N2MAF Sh with improved ductility
[BLL-BISI-TRANS-22233-(9022.06)] N85-28031

IMPEDANCE
Ionospheric effects on antenna impedance
[BMFT-FB-W-84-052] N85-28217

IMPLANTED ELECTRODES (BIOLOGY)
Encapsulation and packaging of a semiconductor multielectrode array for cortical implantation
[AD-A153180] N85-28535

IMPURITIES
An Impurity Control Test Facility (ICTF) for the study of fusion reactor/plasma edge materials
[DE85-007946] N85-28810
Impurity control and vacuum pumping system design and analysis for next-generation Tokamaks
[DE85-009291] N85-28815
The transport of neutral H, D, T and He and O in the boundary layers of a Tokamak plasma
[REPT-84-153] N85-28817

INCIDENCE
Measurement and interpretation of electron angle at MABE beam stop
[DE85-008583] N85-28755

INCLUSIONS
Fracture toughness of MgCr(sub)2O(sub)4-ZrO(sub)2
[DE85-007945] N85-27982
Weldability of micro-alloy steels as reaction of structure and inclusions
[BLL-BISI-TRANS-22198-(9022.06)] N85-28027
Physio-chemical mechanisms of the processes of the formation of globular inclusions in ball-bearing metal
[BLL-BISI-TRANS-22235-(9022.06)] N85-28030
The behaviour of nitride inclusions in nickel-base alloys
[BLL-BISI-TRANS-22396-(9022.06)] N85-28058
Quality testing to the specifications of the Stahl-Eisen-Pruefblatt 1570/71 using an automatic image analysis system
[BLL-BISI-TRANS-22253-(9022.06)] N85-28385

INCOHERENT SCATTER RADAR
EISCAT electron density studies
[AD-A152820] N85-28496

INCOMPRESSIBILITY
Vortices in non-Newtonian fluids
[AD-A153169] N85-28269

INCOMPRESSIBLE FLOW
Steady, incompressible, inviscid flow through a finite collapsible tube under longitudinal tension
[REPT-84-01] N85-28278
A second-order pressure-correction method for viscous incompressible flow
[REPT-84-15] N85-28280

INCONEL (TRADEMARK)
Fatigue strength of Inconel 625 plate and weldments used in the DIII-D configuration vacuum vessel
[DE85-008276] N85-28427

INDEPENDENT VARIABLES
Development factors and field dependence-independence
[AD-A152337] N85-28545

INDEXES (DOCUMENTATION)
Bibliography of Lewis Research Center technical publications announced in 1984
[NASA-TM-87012] N85-28876

INDEXES (RATIOS)
Forecast verification of the 10.7 centimeter solar flux and the Ap daily geomagnetic activity indices
[AD-A152959] N85-28499

INDIAN OCEAN
Characteristics of North Indian Ocean tropical cyclone activity
[AD-A153085] N85-28524

INDIAN SPACECRAFT
Time synchronization experiments with APPLE N85-28323

INDIUM COMPOUNDS
Materials-process interactions in ternary alloy semiconductors
[AD-A153133] N85-28832

INDIUM PHOSPHIDES
InP materials
[AD-A152341] N85-28826

INDUCTION HEATING
Influence of heat treatment parameters on the properties of induction hardened Ni-Cr-Mo steels
[BLL-BISI-TRANS-2499-(9022.06)] N85-28053

INDUCTION MOTORS
Commercialization of the power factor controller
[NASA-CR-171500] N85-28221

INDUSTRIAL PLANTS
Conversion of methanol to gasoline: Engineering and construction of the demonstration plant
[DE85-003237] N85-28133
Robots, automatic devices inside VW's Wolfsburg plant N85-28186
USSR report: Machine tools and metalworking equipment
[JPRS-UMM-84-014] N85-28188

INDUSTRIAL SAFETY
Robotic safety systems and methods: Savannah River site
[DE85-008261] N85-28375

INDUSTRIES
USSR report: Engineering and equipment
[JPRS-UEQ-85-004] N85-28142
West Europe report: Science and technology
[JPRS-WST-84-024] N85-28183

INELASTIC SCATTERING
Neutron scattering and reactions on 59Co from 1 to 20 MeV
[AERE-R-11439] N85-28729
Experimental studies of diffractive phenomena
[DE85-006812] N85-28749
Possible indication of an A-dependence of R in deep-inelastic electron scattering from nuclei
[DE85-008174] N85-28763
New experimental results in two photon physics
[NIKHEF-H/84-16] N85-28776

INEQUALITIES
An inequality and its application to the truncated distributions N85-28673

INERTIA
The Shock and Vibration Digest, volume 17, no. 2
[AD-A153129] N85-28400
Recent progress in the dynamic plastic behaviour of structures, part 4 N85-28402

INERTIAL FUSION (REACTOR)
Heavy ion fusion accelerator research in the US
[DE85-008465] N85-28767

INERTIAL NAVIGATION
A system for take-off and landing measurements (STALINS)
[B8580072] N85-27849
Simulation of gyrocompassing alignment and calibration of strapdown inertial navigation system in a swaying vehicle
[DFVLR-MITT-84-20] N85-27850

INFERENCE
A complete inference system for regular processes with silent moves
[CWI-CS-R8420] N85-28638

INFILTRATION
Development of high temperature resistant noncorrodible silicon carbide components for gas turbine applications, follow-up report
[BMFT-FB-T-85-016] N85-28126

INFORMATION
Verbal information processing paradigms: A review of theory and methods
[AD-A153229] N85-28880

INFORMATION ADAPTIVE SYSTEM
Alphabet-constrained data compression
[AD-A152887] N85-28667

INFORMATION DISSEMINATION
Australian seismological report, 1980
[REPT-252] N85-28473
Defense data network support concept analysis
[AD-A153214] N85-28649
Origin, processing, and dissemination of scientific news, with examples from 20 research institutes
[JUEL-1940] N85-28882

INFORMATION MANAGEMENT
Distributed systems management in wide area networks
[CWI-CS-R8419] N85-28651

INFORMATION RETRIEVAL
Organization of scientific, technical information services N85-28673
Energy data base: Subject categories and scope
[DE84-017376] N85-28881

INFORMATION SYSTEMS
The interactive generation of specifications for an onboard software series (GISELE) N85-27906
US Naval Observatory collection and utilization of time comparison data N85-28292
Centralized Storm Information System (CSIS)
[NASA-CR-175898] N85-28506
A report from the Space Science and Engineering Center, the University of Wisconsin-Madison, Madison, Wisconsin N85-28507
Test and evaluation plan for the Centralized Storm Information System N85-28508
Efforts at office automation and information systems utilization at Martin Marietta Energy Systems, Incorporated
[DE85-006154] N85-28833
USSR report: Science and technology policy
[JPRS-UST-85-008] N85-28872
Organization of scientific, technical information services N85-28873
The development of information systems at NLR
[B8580079] N85-28884

INFORMATION THEORY
Chemical applications of topology and group theory. 17: An information theoretical approach to polyhedral symmetry
[AD-A152821] N85-27995
A software simulation study of a (255,223) Reed-Solomon encoder-decoder
[NASA-CR-175872] N85-28192

Distributed memory
[AD-A153364] N85-28554
Language design, computers and brains
[AD-A152819] N85-28594
Counting is easy — Turing machines
[CWI-CS-R8423] N85-28606
The role of duality in optimization problems involving entropy functionals, with applications to information theory
[AD-A152336] N85-28713

INFORMATION TRANSFER
Oral discussion, group-to-individual transfer and achievement in cooperative learning groups
[AD-A153209] N85-28552
Study of raster metafile formats
[AD-A153322] N85-28624
Interfacing the VAX 11/780 using berkeley UNIX 4.2BSD and Ethernet based Xerox Network Systems
[AD-A153174] N85-28647

INFRARED ASTRONOMY
A new luminosity component in 3C48
[NASA-CR-175840] N85-28894
Balloon-borne, He-cooled Fourier transform spectrometer for far infrared astronomy
[MPE-IR-41] N85-28899

INFRARED ASTRONOMY SATELLITE
IRAS: Space technology from the Netherlands
[B85101841] N85-27929
The IRAS end-to-end data system
[NLR-MP-83056-U] N85-28883

INFRARED DETECTORS
Analysis and modeling for thermal focal plane arrays
[AD-A153156] N85-28329

INFRARED INTERFEROMETERS
Special topics in infrared interferometry — Michelson interferometer development
[NASA-TM-87472] N85-28794

INFRARED LASERS
Theory of laser-stimulated surface process. 2: A generalized-master-equation approach to energy transfer between an IR laser, an aspecties and phonons
[AD-A153083] N85-28344

INFRARED RADIATION
Analysis and modeling for thermal focal plane arrays
[AD-A153156] N85-28329

INFRARED SCANNERS
Thermal Infrared Multispectral Scanner (TIMS): An investigator's guide to TIMS data
[NASA-CR-175875] N85-28286
Developments in remote sensing
[B8580069] N85-28441
Comparison of measurement and simulation results of radiation temperatures applied to the thermal mapping of Munich
[DFVLR-FB-85-06] N85-28442

INFRARED SPECTRA
Evaluation of used crankcase oils using computerized infrared spectrometry
[AD-A152993] N85-27999
Evaluation of used crankcase oils using computerized infrared spectrometry. Appendices
[AD-A152994] N85-28000
The spectroscopy and reaction kinetics of coordinated unsaturated metal carbonyls
[AD-A153079] N85-28003

INFRARED SPECTROMETERS
Evaluation of used crankcase oils using computerized infrared spectrometry. Appendices
[AD-A152994] N85-28000
Balloon-borne, He-cooled Fourier transform spectrometer for far infrared astronomy
[MPE-IR-41] N85-28899

INFRARED SPECTROPHOTOMETERS
Evaluation of used crankcase oils using computerized infrared spectrometry
[AD-A152993] N85-27999

INFRARED SPECTROSCOPY
Evaluation of used crankcase oils using computerized infrared spectrometry
[AD-A152993] N85-27999
Evaluation of used crankcase oils using computerized infrared spectrometry. Appendices
[AD-A152994] N85-28000

INFRARED TELESCOPES
IRAS: Space technology from the Netherlands
[B85101841] N85-27929
Long life feasibility study for the shuttle infrared telescope facility
[NASA-CR-3722] N85-28893

INFRARED TRACKING
Presentations at the Tri-Service Cloud Modeling Workshop (2nd), held at the Naval Surface Weapons Center, White Oak, Maryland, 26-27 June 1984, volume 1
[AD-A152735] N85-28522

INJECTION LASERS
Injection laser structure design
[AD-A153210] N85-28345

INJECTORS
Segmented zoned fuel injection system for use with a combustor
[AD-D011640] N85-27865

INLET FLOW
SSME turbopump turbine computations N85-27944
Analysis of physical-chemical processes governing SSME internal fluid flows
[NASA-CR-175893] N85-28261

INLET NOZZLES
Investigation of heat transfer to a turbine blade cascade using a shock tube
[AD-A153090] N85-27871
Inspection evaluation and repair of the flawed feedwater nozzle of the 50 MWe Dodewaard GKN boiling water reactor
[ISBN-90-353-0017-3] N85-28394

INLET PRESSURE
Investigation of heat transfer to a turbine blade cascade using a shock tube
[AD-A153090] N85-27871

INLET TEMPERATURE
SSME fuel preburner two-dimensional analysis N85-27943

INOCULATION
Inoculation of non-metallic inclusions in steel 17GS
[BLL-BISI-TRANS-22431-(9022.06)] N85-28042
Effects of the cooling rate on the structure of the graphite in inoculated irons
[BLL-BISI-TRANS-22305-(9022.06)] N85-28083

INORGANIC COMPOUNDS
Chemicals identified in human biological media, a data base, volume 6, part 1
[DE85-008768] N85-28542

INPUT
A study of error rates in voice recognition
[AD-A153282] N85-28211
The touch panel system: Design and development
[AD-A153014] N85-28596
A comparison of numeric data entry with touch-sensitive and conventional numeric keypads
[AD-A153276] N85-28598

INPUT/OUTPUT ROUTINES
Sample problems for STAGSC-1
[AD-A153142] N85-28621
Complete development and implement AFIT/ENG database management system, volume 1
[AD-A153043] N85-28866

INSPECTION
Magnetic flux leakage inspection: Principles and applications
[BLL-BISI-TRANS-22248-(9022.06)] N85-28382
Inspection of welds and the factors improving its effectiveness in welded structure fabrication
[BLL-BISI-TRANS-22194-(9022.06)] N85-28387
Effects of inspection errors on curtailed Dorfman-type procedures
[AD-A152376] N85-28699
Statistical effects of imperfect inspection sampling. Part 2: Double sampling, link sampling and grading
[AD-A152377] N85-28700

INSULATORS
Investigation of charge transport in the thermoelectret state of some ceramics and glasses
[DE85-009318] N85-28122

INTEGRAL EQUATIONS
On Long's solution to hydrostatic flow over mountains
[DFVLR-MITT-84-02] N85-28503

INTEGRAL TRANSFORMATIONS
Uniform asymptotic expansions of integrals
[CWI-AM-R8412] N85-28694
Dynamical systems and numerical integration
[CWI-AM-R8413] N85-28695

INTEGRATED CIRCUITS
East Europe report: Science and technology
[JPRS-ESA-85-017] N85-28177
Goals, achievements of microelectronics program N85-28179
Uses of, experiences in production of custom designed IC's N85-28180
Modern equipment for manufacture of IC's in Hungary N85-28181
SC filters and design centering of integrated circuits. Part 2: Design centering of integrated circuits
[BMFT-FB-T-84-265-PT-2] N85-28257
Investigation of semiconductor clad optical waveguides
[NASA-CR-175870] N85-28785

INTEGRATED OPTICS
Investigation of semiconductor clad optical waveguides
[NASA-CR-175870] N85-28785

INTERACTIONAL AERODYNAMICS
Propulsion efficiency of vibrating bodies in subsonic gas stream N85-28159

INTERACTIVE CONTROL
A modern control theory enhancement to an Interactive Control Engineering Computer Analysis Package (ICECAP)
[AD-A153249] N85-28622

INTERCALATION
A micrographic and gravimetric study of intercalation and deintercalation of graphite fibers
[NASA-TM-87026] N85-28110

INTERFACES
A new technique for system-to-system transfer of surface data N85-28589
CAMAC 488 module: 68000 based GPIB interface module
[DE85-009367] N85-28635
Incorporation of Monte Carlo electron interface studies into photon general cavity theory
[DE85-007674] N85-28772
The effect of ion-bombardment-induced atomic mixing on depth-profiling of interfaces
[AD-A153199] N85-28834

INTERFERENCE GRATING
Laser plasma LINAC
[DE85-008294] N85-28348
Measurement of ultrasonic fields in transparent media using a scanning differential interferometer
[NASA-CR-175921] N85-28726

INTERFEROMETRY
Acoustooptic pulse-echo transducer system
[NASA-CR-175919] N85-28224
Transport in aqueous battery systems
[DE85-007246] N85-28251
Water vapor radiometry research and development phase
[NASA-CR-175887] N85-28512

INTERNAL COMBUSTION ENGINES
Exhaust systems for passenger vehicles: Test procedure for resistance to internal corrosion of silencers
[BLL-BISI-TRANS-22360-(9022.06)] N85-28361
Urban vehicle research project
[DE85-005444] N85-28889

INTERNAL FRICTION
Acoustic oscillations of rods and plates N85-28170

INTERNATIONAL COOPERATION
Construction 1976-1980: Design, manufacturing, calibration of the German-Dutch wind tunnel (DNW) N85-27913
European utilization aspects of a US manned space station, volume 1
[ESA-CR(P)-1987-VOL-1] N85-27926
European utilization aspects of a US manned space station, volume 2
[ESA-CR(P)-1987-VOL-2] N85-27927
Finland, Sweden cooperate in composites research N85-28184

INTERNATIONAL MAGNETOSPHERIC STUDY
IMS (International Magnetospheric Study) contributions to the understanding of auroral precipitation, transport, and particle sources
[AD-A152320] N85-28492

INTERNATIONAL RELATIONS
Technology and Soviet political choices
[AD-P004566] N85-28861
Close encounters with S/T (science and technology) in the Soviet Union
[AD-P004570] N85-28864

INTERNATIONAL SUN EARTH EXPLORERS
The boundary layers as the primary transport regions of the Earth's magnetotail
[AD-A152714] N85-28496

INTERPLANETARY COMMUNICATION
Performance analysis of the DSN baseband assembly (Bba) Real-Time Combiner (RTC)
[NASA-CR-175878] N85-28190

INTERPOLATION
Evaluation of interpolative modeling concepts for fatigue crack growth at elevated temperature
[AD-A153222] N85-28422
Shape preserving spline interpolation N85-28564
A survey of patch methods N85-28567
Convex interpolating splines of arbitrary degree N85-28574
A natural bias approach to cardinal spline curves N85-28575
Montonicity preserving bicubic interpolation, revision 1
[DE85-007976] N85-28683
Confidence intervals based on interpolated order statistics
[AD-A152607] N85-28701

INTERPROCESSOR COMMUNICATION
Interfacing the VAX 11/780 using Berkeley Unix 4.2.BSD and Ethernet based Xerox network systems, volume 1 [AD-A152953] N85-28645
A real-time executive for multiple-computer clusters [AD-A152961] N85-28646
Interfacing the VAX 11/780 using berkeley UNIX 4.2BSD and Ethernet based Xerox Network Systems [AD-A153174] N85-28647
Multicomputer operating systems and applications [AD-A153205] N85-28648
Distributed elections in a ring of processors using Archimedean time [CWI-CS-R8416] N85-28653
INTERSECTIONS
Comparison of two algebraic methods for curve/curve intersection N85-28591
A comparison of three curve intersection algorithms N85-28592
INTRUSION
Explanation of Russian models: Saudi Arabian seismic refraction profile N85-28487
INVARIANCE
Generalised translation invariance and systems theory [CRM-8501] N85-28657
INVERSIONS
Efficient parallel solution of linear systems [AD-A152663] N85-28663
INVISCID FLOW
Steady, incompressible, inviscid flow through a finite collapsible tube under longitudinal tension [REPT-84-01] N85-28278
ION ACCELERATORS
Heavy ion physics at BNL, the AGS and RHIC [DE85-005951] N85-28760
Heavy ion fusion accelerator research in the US [DE85-008465] N85-28767
ION ATOM INTERACTIONS
Spin distributions in heavy ion fusion at and below the Coulomb barrier [DE85-007817] N85-28751
Theoretical studies of heavy ion scattering processes [DE85-008823] N85-28753
ION BEAMS
Uniaxial angular accelerometers N85-28173
Heavy ion fusion accelerator research in the US [DE85-008465] N85-28767
Restrike particle beam experiments on a dense plasma focus. Opening switch research on a dense plasma focus [AD-A152991] N85-28802
ION CURRENTS
Electrochemistry of polymer films not immersed in solution: Electron transfer on an ion budget [AD-A152989] N85-27998
ION DENSITY (CONCENTRATION)
Electron and ion distributions at high latitudes as measured by the Air Force polar orbiting satellites [AD-A153242] N85-28500
ION EXCHANGE RESINS
Luminescence probe studies of ionomers. I: Steady-state measurements from nafion membrane [AD-A152475] N85-28730
ION IMPLANTATION
High temperature position sensors based on monolithic GaAs Hall IC [BMFT-FB-T-84-266] N85-28337
Electrical research on solar cells and photovoltaic materials [NASA-CR-175897] N85-28452
Communications and logic systems at millimeter wave frequencies, summary N85-28825
ION IRRADIATION
The effect of ion-bombardment-induced atomic mixing on depth-profiling of interfaces [AD-A153199] N85-28834
ION SCATTERING
Theoretical studies of heavy ion scattering processes [DE85-008823] N85-28753
Multiple scattering effects in low energy alkali ion scattering: Application to the analysis of adsorbate ordering and bonding geometry [DE85-007575] N85-28757
IONIC COLLISIONS
Homogeneous processes of atmospheric interest [NASA-CR-175770] N85-28475
Experimental approaches to the measurement of dielectronic recombination [DE85-00627] N85-28743
Nonrelativistic theory of heavy-ion collisions [DE85-007538] N85-28747
IONIZATION
Resonance ionization mass spectrometry of carbon [DE85-009040] N85-28018
Recent advances in optical measurement methods in physics and chemistry [DE85-008695] N85-28792
IONOSPHERE
Ionospheric effects on antenna impedance [BMFT-FB-W-84-052] N85-28217
The boundary layers as the primary transport regions of the Earth's magnetotail [AD-A152714] N85-28496
EISCAT electron density studies [AD-A152820] N85-28498
IONOSPHERIC DISTURBANCES
Scintillation using NNSS satellites [AD-A152804] N85-28207
The Shock and Vibration Digest, volume 17, no. 2 [AD-A153129] N85-28400
The effects of seismic waves N85-28401
IONOSPHERIC DRIFT
Geophysical plasmas and atmospheric modeling [AD-A152805] N85-28497
IRON
Effect of superconducting solenoid model cores on spanwise iron magnet roll control [NASA-TM-86378] N85-27915
The loss of material from the cathode of metal arcs [NASA-TM-77845] N85-27965
Multi-phase crystallization of ferrous alloys [BLL-BISI-TRANS-22441-(9022.06)] N85-28037
Effect of the agressive action of soil on metallic pipelines. New possibilities for the passive and active corrosion protection [BLL-BISI-TRANS-21630-(9022.06)] N85-28070
Kinetics of the formation of a complex alloyed boride coating on iron and its properties [BLL-BISI-TRANS-22303-(9022.06)] N85-28084
Temperature and manganese content dependences of tensile deformation in iron-high manganese binary alloys [DE85-007656] N85-28098
Uniaxial stress induced symmetry breaking for muon sites in Fe N85-28820
IRON ALLOYS
The disordering process in an L12 ordered alloy [DE85-008152] N85-28093
IRON COMPOUNDS
Effects of the cooling rate on the structure of the graphite in inoculated irons [BLL-BISI-TRANS-22305-(9022.06)] N85-28083
IRON ORES
World iron ore reserves [BLL-BISI-TRANS-22280-(9022.06)] N85-28435
IRON OXIDES
Influence of eutectic silicate inclusions on micro-processes during deformation and fracture of 12GS steel [BLL-BISI-TRANS-22296-(9022.06)] N85-28073
IRRADIATION
Influence of composition on the microstructural evolution and mechanical properties of irradiated Fe-Ni-Cr ternaries [DE85-007462] N85-28094
ISOMERIZATION
Chemical applications of topology and group theory. 17: An information theoretical approach to polyhedral symmetry [AD-A152821] N85-27995
ISOSTATIC PRESSURE
Hot Isostatic Pressing (HIP): Techniques, applications and economical use [JUEL-SPEZ-288] N85-28141
ISOTHERMAL FLOW
Predictions and measurements of isothermal flowfields in axisymmetric combustor geometries [NASA-CR-174916] N85-27867
ITERATION
Polynomial iteration for nonsymmetric indefinite linear systems [AD-A153094] N85-28671
ITERATIVE SOLUTION
Projected discrete ordinates methods for numerical transport problems [DE85-005632] N85-28678
A convolution integral equation solved by Laplace transformation [CWI-AM-R8409] N85-28692

J

JAGUAR AIRCRAFT
An update of experience on the fly by wire Jaguar equipped with a full-time digital flight control system N85-27893
JET AIRCRAFT
Flight trials of a modified gulfstream commander carrying external stores [AD-A153376] N85-27859
JET AIRCRAFT NOISE
Fan noise suppression in turbofan engines [B8580076] N85-27872
JET ENGINE FUELS
Jet fuel instability mechanisms [NASA-CR-175856] N85-28127
JET ENGINES
Testing of materials and coatings for jet engine components under simulated operational conditions [B8580073] N85-27873
JET FLOW
Background noise measurements from jet exit vanes designed to reduced flow pulsations in an open-jet wind tunnel [NASA-TM-86383] N85-27916
JET THRUST
Characteristics of a confined jet thrust vector control nozzle [AD-A153087] N85-28268
JET VANES
Background noise measurements from jet exit vanes designed to reduced flow pulsations in an open-jet wind tunnel [NASA-TM-86383] N85-27916
JOINTS (JUNCTIONS)
Elastic equilibrium of composite shells with finite shear rigidity N85-28163
JOSEPHSON JUNCTIONS
Random access memory technologies [AD-A153089] N85-28597

K

KALMAN FILTERS
Applied Kalman filtering: An overview N85-28313
Kalman filtering with a two-state clock model N85-28314
Kalman filter estimates of the NAVSTAR satellite clock parameters N85-28315
A plan for the development of inertial reconstruction of initial state clock (IRIS) N85-28317
KETONES
Polyaromatic ether-sulfone-ketones with fluoro-substituted-p-cyclophane units as cross-linking sites [AD-D011649] N85-28105
KINEMATICS
Dynamic creep buckling: Analysis of shell structures subjected to time-dependent mechanical and thermal loading N85-27959
KINETIC EQUATIONS
Analysis of nonlinear parabolic equations modeling plasma diffusion across a magnetic field [DE85-007683] N85-28807
KINETICS
Future fundamental combustion research for aeropropulsion systems [NASA-TM-87049] N85-27870
Dynamic creep buckling: Analysis of shell structures subjected to time-dependent mechanical and thermal loading N85-27959
Research on the kinetics of phase changes in solids [AD-A152387] N85-27969
Detailed chemical kinetic study of the effect of molecular structure on autoignition of fuel-air mixtures [DE85-004424] N85-28010
KLYSTRONS
VULTURE manual [DE85-006873] N85-28631
KOLMOGOROFF THEORY
Kolmogorov and scalar spectral regimes in numerical turbulence [NASA-TM-86609] N85-28264
KOVAR (TRADEMARK)
Sintering and properties of metal-ceramic alloys of the Kovar type [BLL-BISI-TRANS-21822-(9022.06)] N85-28060

L

LABORATORIES
Laboratory research: A question of when, not if [AD-A153298] N85-28667
Techical services at NLR [B8561898] N85-28871
LACQUERS
New air-curing lacquer systems with high solids content [BMFT-FB-T-85-005] N85-28124
LAGRANGE COORDINATES
Users manual for coordinate generation code CRDSRA [NASA-CR-172584] N85-27824

LAGRANGE MULTIPLIERS
Modern test of chiral anomalies
[DE85-005892] N85-28680

LAGUERRE FUNCTIONS
A class of polynomials related to those of Laguerre
[CWI-AM-R8411] N85-28693

LAMINAR BOUNDARY LAYER
Proceedings of the 9th US Air Force and the Federal Republic of Germany Data Exchange Agreement Meeting, Viscous and Interacting Flow Field Effects
[AD-A153020] N85-28266

LAMINAR FLOW
Heat transfer in pipes
[NASA-TM-77838] N85-28262

LAMINATES
Solution to eigenvalue problems of antisymmetric cross-ply and antisymmetric angle-ply laminated plates using affine transformations
[AD-A153040] N85-27980
Strength and failure analysis of composite laminates with holes at room and elevated temperatures
[AD-A153263] N85-27981
Multiconductor flat cable
[AD-D011635] N85-28218
Biaxial buckling of specially orthotropic, symmetric composite rectangular plates
[AD-A152958] N85-28417

LANDAU DAMPING
I. F. S. (Institute for Fusion Studies) Newsletter, Volume 4, Number 1
[DE85-007917] N85-28809

LANDFORMS
Airphoto interpretation of vegetation and landforms for soil mapping N85-28436

LANDING GEAR
Active control landing gear for ground load alleviation N85-27902

LANDING LOADS
Active control landing gear for ground load alleviation N85-27902

LANDING RADAR
Investigation of imaging and flight guidance concepts for rotorcraft zero visibility approach and landing
[NASA-CR-166571] N85-27843

LANDSAT 1
Developments in remote sensing
[B8580069] N85-28441

LANGUAGES
Expressiveness and language choice
[AD-A153280] N85-28623

LAPLACE TRANSFORMATION
A convolution integral equation solved by Laplace transformation
[CWI-AM-R8409] N85-28692

LARGE SCALE INTEGRATION
Efficient VLSI (Very Large Scale Integration) fault simulation
[AD-A152661] N85-28233
High temperature position sensors based on monolithic GaAs Hall IC
[BMFT-FB-T-84-266] N85-28337

LARGE SPACE STRUCTURES
Incorporating control into the optimal structural design of large flexible space structures
[AD-A152858] N85-27937
Mathematical modeling and control of a large space structure as applied to a shuttle-antenna configuration
[AD-A153269] N85-27939
The Shock and Vibration Digest, volume 17, no. 1
[AD-A151051] N85-28397

LARMOR RADIUS
Stability of high energy particle plasmas to MHD-like modes
[DE85-007879] N85-28803

LASER ANEMOMETERS
Feasibility of mapping velocity flow fields in SSME powerhead by laser anemometry techniques N85-27971

LASER APPLICATIONS
The development of laser analytical methods for the characterization of solid-liquid and solid-high pressure gas interfaces
[AD-A152382] N85-27988
Measurement of Franck-Condon factors for the v'=0 progression in the B-X system of PO
[AD-A152734] N85-27993
X-ray crystallography of steel U8 after pulsed laser hardening
[BLL-BISI-22444-(9022.06)] N85-28038
Technological apparatus for laser treatment of materials N85-28174
International time transfer and portable clock evaluation using GPS timing receivers: Preliminary results N85-28303
Timing of spacecraft date: Time accuracy requirements and timing facilities of the European Space Agency (ESA) N85-28307
Laser measurements of distances from the ORELA neutron target to experiment stations along flight paths 1 and 6
[DE85-009457] N85-28352
Presentations at the Tri-Service Cloud Modeling Workshop (2nd), held at the Naval Surface Weapons Center, White Oak, Maryland, 26-27 June 1984, volume 1
[AD-A152735] N85-28522
Optical system for measuring shadowgraph data
[AD-D011642] N85-28784
Recent advances in optical measurement methods in physics and chemistry
[DE85-008695] N85-28792

LASER CAVITIES
Design and construction of a CW ND:YAG laser using a single elliptical cavity and water cooled krypton arc lamp pumping
[AD-A152657] N85-28340

LASER DAMAGE
Raman studies of laser damaged single and multi-layer optical coatings
[DE85-009431] N85-28351

LASER DOPPLER VELOCIMETERS
Incident beam polarization for laser Doppler velocimetry employing a sapphire cylindrical window
[NASA-TM-87064] N85-28786

LASER FUSION
Sub-nanosecond cinematography in laser fusion research: Current techniques and applications at the Lawrence Livermore Laboratory
[DE85-007252] N85-28334
Microwave experimental studies of laser fusion
[DE85-008327] N85-28814
Rapid growth of potassium dihydrogen phosphate crystals
[DE85-007261] N85-28839

LASER GYROSCOPES
Measurements of laser gyro errors as a function of the beam path
[DFVLR-FB-85-02] N85-28336

LASER OUTPUTS
Photoionization mass spectrometry with VUV hydrogen laser source
[AD-A153362] N85-28009
Operating characteristics, absorptivity/reflectivity measurements, and pulse system design of the NPS (Naval Postgraduate School) hydrogen fluoride/deuterium fluoride laser
[AD-A152712] N85-28341
Low voltage free electron laser development
[AD-A152917] N85-28342
Instabilities and chaotic behavior of active and passive laser systems
[AD-A153366] N85-28346

LASER PLASMAS
Laser plasma LINAC
[DE85-008294] N85-28348
Microwave experimental studies of laser fusion
[DE85-008327] N85-28814

LASER SPECTROSCOPY
High resolution spectroscopy of C13O16 in gas mixtures
[AD-A152625] N85-27991
Laser measurement techniques: Laser spectroscopy in semiconductors
[DE85-007887] N85-28350
Recent advances in optical measurement methods in physics and chemistry
[DE85-008695] N85-28792

LASER WELDING
Laser welder for fabricating neutron tubes
[DE85-009965] N85-28377
Experimental and theoretical studies on transport processes in laser welding
[DE84-008572] N85-28378

LASER WINDOWS
Incident beam polarization for laser Doppler velocimetry employing a sapphire cylindrical window
[NASA-TM-87064] N85-28786

LASERS
Photoionization mass spectrometry with VUV hydrogen laser source
[AD-A153362] N85-28009
High precision materials characterization in the near millimeter wave-length range
[AD-A153267] N85-28331
Instabilities and chaotic behavior of active and passive laser systems
[AD-A153366] N85-28346
Support structures for optical components in the Laser Demonstration Facility
[DE85-008879] N85-28349

LATEX
Preparation of polystryene latex particles in a rotating reactor
[NASA-CR-171475] N85-28108

LATHES
Assessing the machinability of gearwheel steels during manufacture
[BLL-BISI-TRANS-22343-(9902.06)] N85-28365

LATTICE VIBRATIONS
The temperature dependence of diffracted beam intensities in atom-surface scattering
[AD-A152762] N85-28736

LATTICES (MATHEMATICS)
Lattice actions improved by block-spin renormalisation group and maximally symmetric lattices
[DE85-007416] N85-28841

LAUNCH VEHICLES
Computer program for prediction of capture maneuver probability for an on-off reaction controlled upper stage
[NASA-CR-165937] N85-28611

LEAD ACID BATTERIES
Test and evaluation of the Hoppecke Model E240G144/16 electric vehicle battery charger
[DE85-900573] N85-28253

LEADERSHIP
Individual characteristics and unit performance: A review of research and methods
[AD-A153145] N85-28550
The effects of controversy and concurrence seeking on effective decision making
[AD-A153370] N85-28555
Central problems in the management of innovation
[AD-A152598] N85-28852

LEADING EDGES
Some effects of sweep direction and strakes for wings with sharp leading edges
[CA-8421] N85-27826
On the effect of wing taper and sweep direction on leading edge transition
[CA-8435] N85-27827

LEAKAGE
Magnetic flux leakage inspection: Principles and applications
[BLL-BISI-TRANS-22248-(9022.06)] N85-28382
Differential between crack and pseudo-crack indications by means of objective magnetic flux leakage testing
[BLL-BISI-TRANS-22033-(9022.06)] N85-28386

LEARNING
The impact of group processing on achievement in cooperative learning groups
[AD-A153168] N85-28551
Oral discussion, group-to-individual transfer and achievement in cooperative learning groups
[AD-A153209] N85-28552
Biofeedback and performance: An update
[AD-A153228] N85-28553

LEARNING THEORY
Oral discussion, group-to-individual transfer and achievement in cooperative learning groups
[AD-A153209] N85-28552

LEAST SQUARES METHOD
Symbolic Givens reduction in large sparse least squares problems
[DE85-008685] N85-28681
A multiple regression technique for detecting outliers
[REPT-84-33] N85-28706
On the condition number of modified moment matrices arising from least squares approximation in the complex plane
[AD-A152353] N85-28714
Analytical generation of satellite orbits at the RAE (Royal Aircraft Establishment)
[AD-A152655] N85-28901

LEAVES
Light scattering by leaf layers with application to canopy reflectance modeling: The Scattering by Arbitrarily Inclined Leaves (SAIL) model
[NLR-MP-84011-U] N85-28796

LEE WAVES
Kinetic energy and vorticity of lee cyclones
[MITT-40] N85-28502

LIFE (DURABILITY)
Reexamination of cumulative fatigue damage laws N85-27962
Optical strain measurement system development N85-27969
Heat flux sensor calibrator N85-27970
Feasibility of mapping velocity flow fields in SSME powerhead by laser anemometry techniques N85-27971
A test methodology for an automated and interactive software development environment
[AD-A152857] N85-28618

LIFT
Aerodynamic performance of a wing in ground effect using the PANAIR program
[AD-A153303] N85-27832
Method of calculating separation flow of subsonic gas stream around wings N85-28161
LIFT DRAG RATIO
Aerodynamic performance of a wing in ground effect using the PANAIR program
[AD-A153303] N85-27832
LIGHT (VISIBLE RADIATION)
Pursuit tracking performance and flash disruption: The effects of training the non-dominant eye on target reacquisition
[AD-A153404] N85-28541
The touch panel system: Design and development
[AD-A153014] N85-28596
System of white-light density pseudocolor encoding with three primary colors
[AD-D011651] N85-28791
LIGHT IONS
Experiments with light ions at CERN super proton synchrotron
[DE85-007625] N85-28744
LIGHT MODULATION
Construction and analysis of a PRIZ spatial light modulator exhibiting dynamic image selection
[AD-A152318] N85-28787
LIGHT SCATTERING
Application of scattering methods to the studies of the structure of polymer blends
[IFPR-13/1984] N85-28104
Earth observation modeling based on layer scattering matrices
[NLR-MP-84015-U] N85-28440
Studies of optical-beam phase-conjugation by nonlinear refraction
[AD-A152865] N85-28788
Light scattering by leaf layers with application to canopy reflectance modeling: The Scattering by Arbitrarily Inclined Leaves (SAIL) model
[NLR-MP-84011-U] N85-28796
LIGHT SPEED
On the propagation speed in relativistic quantum mechanics
[CWI-AM-R8410] N85-28848
LIMITS (MATHEMATICS)
Limiting values of stress state index after rupture of metals
[BLL-BISI-TRANS-22293-(9022.06)] N85-28407
LINEAR ACCELERATORS
Laser plasma LINAC
[DE85-008294] N85-28348
Measurement and interpretation of electron angle at MABE beam stop
[DE85-008583] N85-28755
LINEAR ARRAYS
Development of a second-generation linear Fresnel Photovoltaic and Thermal (PVT) concentrator array, including fabrication and installation of a 200 square meter collector field
[DE85-008473] N85-28465
LINEAR EVOLUTION EQUATIONS
Symmetric linear multistep methods for second-order differential equations with periodic solutions
[CWI-NM-R8501] N85-28698
LINEAR PROGRAMMING
The interface with decision makers in interactive multiobjective linear programming
[REPT-84-38] N85-28637
Operations research
[B8581897] N85-28712
LINEAR SYSTEMS
Mathematical modeling and control of a large space structure as applied to a shuttle-antenna configuration
[AD-A153269] N85-27939
Generalised translation invariance and systems theory
[CRM-8501] N85-28657
Efficient parallel solution of linear systems with hyperbolic rotations
[AD-A152355] N85-28661
Efficient parallel solution of linear systems
[AD-A152663] N85-28663
Polynomial iteration for nonsymmetric indefinite linear systems
[AD-A153084] N85-28671
LININGS
Determination of wear intensity and resource of crankshafts and cylinder liners of ZIL-130 and ZMZ-53 engines
[BLL-BISI-TRANS-21393-(9022.06)] N85-28355
LINKAGES
Vibrations of rotors connected through couplings with backlash N85-28147
LIQUID CRYSTALS
InP materials
[AD-A152341] N85-28828
LIQUID FUELS
Liquid propellants for use in guns: A review
[AD-A153051] N85-28131
LIQUID HELIUM
NMR manometer for measuring high pressures at liquid-helium temperatures N85-28171
Balloon-borne, He-cooled Fourier transform spectrometer for far infrared astronomy
[MPE-IR-41] N85-28899
LIQUID METALS
Flat magnetohydrodynamic induction pump N85-28145
Dependence of characteristics of centrifugal magnetohydrodynamic conduction pump on electrical conductance of end walls. Part 1: Experiment N85-28146
Liquid-metal transducers for strain measurement during in-pile materials testing N85-28178
LIQUID OXYGEN
Flow-induced vibration of SSME main injector liquid-oxygen posts N85-27951
LIQUID PHASE EPITAXY
Materials-process interactions in ternary alloy semiconductors
[AD-A153133] N85-28832
LIQUID PHASES
Catalyst and reactor development for a liquid phase Fischer-Tropsch process
[DE85-005894] N85-28014
LIQUID PROPELLANT ROCKET ENGINES
A closed loop analysis of POGO instability
[AD-A153121] N85-28132
LIQUID ROCKET PROPELLANTS
A closed loop analysis of POGO instability
[AD-A153121] N85-28132
LIQUID-LIQUID INTERFACES
Free-surface phenomena under low- and zero-gravity conditions
[NASA-CR-175885] N85-27922
LIQUID-SOLID INTERFACES
The development of laser analytical methods for the characterization of solid-liquid and solid-high pressure gas interfaces
[AD-A152382] N85-27988
A Navier-Stokes capillary free boundary in open boat crystal growth
[REPT-84-34] N85-28283
LIQUID-VAPOR INTERFACES
The development of laser analytical methods for the characterization of solid-liquid and solid-high pressure gas interfaces
[AD-A152382] N85-27988
LIQUIDS
Liquid propellants for use in guns: A review
[AD-A153051] N85-28131
LITHIUM
Investigation of the structure and dynamics of electrolytes in solvents used for primary and secondary Li-batteries
[AD-A153099] N85-28240
Experimental study of dissociative attachment in optically-pumped lithium molecules
[AD-A152800] N85-28738
LITHIUM ALLOYS
Aluminum-lithium alloys: The answer of the aluminum industry to the threat of advanced fiber-reinforced materials
[VTH-LR-406] N85-28102
LITHOGRAPHY
Communications and logic systems at millimeter wave frequencies, summary N85-28825
LITHOLOGY
Structural analysis of terrane accretions in the eastern Brooks Range and adjacent areas in central Alaska and Canada
[DE85-008279] N85-28501
LOAD TESTS
Composite loads spectra for select space propulsion structural components N85-27953
Influence of manganese and heat treatment on structure and properties of Fe-0.1 percent-C-14 percent Cr-based steels
[BLL-BISI-TRANS-22299-(9022.06)] N85-28071
LOADING MOMENTS
Calculation of friction at spherical bearing journals in turbomachines N85-28150
LOADS (FORCES)
Structural Integrity and Durability of Reusable Space Propulsion Systems
[NASA-CP-2381] N85-27941
Composite loads spectra for select space propulsion structural components: Probabilistic load model development N85-27954
Dynamic creep buckling: Analysis of shell structures subjected to time-dependent mechanical and thermal loading N85-27959
Overload effects on sustained load crack growth at elevated temperature
[AD-A153223] N85-28091
The Mises yield condition for thin rotationally symmetric shells
[BLL-BISI-TRANS-22047-(9022.06)] N85-28409
LOGIC DESIGN
Optimal design and use of retry in fault tolerant real-time computer systems
[NASA-CR-175920] N85-28643
LOGICAL ELEMENTS
Development of new circuit symbols for binary logic elements
[MBB-Z-39/85-O] N85-28640
LONGITUDINAL CONTROL
In-flight investigation of the influence of pitch damping and pitch control effectiveness on landing approach flying qualities of statically unstable transport aircraft
[DFVLR-FB-84-12] N85-27880
LONGITUDINAL STABILITY
Realisation of relaxed static stability on a commercial transport N85-27899
Active control technology experience with the Space Shuttle in the landing regime N85-27900
LOW CARBON STEELS
The influence of melting practice and of microalloying, with rare earth metals and with boron, on the quality of low-carbon steel
[BLL-BISI-22467-(9022.06)] N85-28036
Multi-phase crystallization of ferrous alloys
[BLL-BISI-TRANS-22441-(9022.06)] N85-28037
Influence of preliminary cold deformation on fineness of pearlite
[BLL-BISI-TRANS-22409-(9022.06)] N85-28054
Influence of thermochemical treatment on properties of low-carbon steel
[BLL-BISI-TRANS-22410-(9022.06)] N85-28055
Preventing the formation of an anomalous structure in chemically sealed low carbon steel
[BLL-BISI-TRANS-22373-(9022.06)] N85-28065
New method for determining stampability of sheet materials
[BLL-BISI-22486-(9022.06)] N85-28360
LOW CONCENTRATIONS
Model computations of radon, and radon decay product, concentrations in an open system; the Hewlett-Packard 41C program RNSS, version 02
[IRI-190-83-12] N85-28775
LOW FREQUENCIES
Timing accuracy of LF and TV synchronization techniques N85-28288
LOW LEVEL TURBULENCE
Adding computationally efficient realism to Monte Carlo turbulence simulation
[NASA-TP-2469] N85-28708
LOW SPEED WIND TUNNELS
Construction 1976-1980: Design, manufacturing, calibration of the German-Dutch wind tunnel (DNW) N85-27913
Background noise measurements from jet exit vanes designed to reduced flow pulsations in an open-jet wind tunnel
[NASA-TM-86383] N85-27916
LOW TEMPERATURE
The fatigue properties of welds at low temperature, according to the type of steel
[BLL-BISI-TRANS-22455-(9022.06)] N85-28410
LOW TEMPERATURE BRAZING
Fatigue crack propagation characteristics and fatigue fracture toughness in 780 MPa grade high strength steel weldments at low temperature
[BLL-BISI-TRANS-22369-(9022.06)] N85-28411
LOW VOLTAGE
Low voltage free electron laser development
[AD-A152917] N85-28342
LUBRICANTS
Evaluation of used crankcase oils using computerized infrared spectrometry
[AD-A152993] N85-27999
Evaluation of used crankcase oils using computerized infrared spectrometry. Appendices
[AD-A152994] N85-28000
New method for determining stampability of sheet materials
[BLL-BISI-22486-(9022.06)] N85-28360
Lubricant and additive effects on spur gear fatigue life
[NASA-TM-87044] N85-28373
LUBRICATING OILS
Investigation of reaction layer formation in high-load capacity lubricating oils
[MPA-83-01] N85-28381

LUMINESCENCE
Laser measurement techniques: Laser spectroscopy in semiconductors
[DE85-007887] N85-28350
Luminescence probe studies of ionomers. I: Steady-state measurements from nafion membrane
[AD-A152475] N85-28730
LUMINOSITY
Electrodes for flash discharge lamps
[DE85-008897] N85-28250
A new luminosity component in 3C48
[NASA-CR-175840] N85-28894
LUMINOUS INTENSITY
Pursuit tracking performance and flash disruption: The effects of training the non-dominant eye on target reacquisition
[AD-A153404] N85-28541
LUNAR BASES
Historical perspective on the Moon base: The British perspective
[DE85-005905] N85-27925
LUNAR GEOLOGY
Adsorption of Hg on lunar samples
[DE85-007948] N85-28906

M

MACHINE TOOLS
Steels with improved machinability
[BLL-BISI-22341-(9022.06)] N85-28061
USSR report: Machine tools and metalworking equipment
[JPRS-UMM-84-014] N85-28188
Applications of robots in machine tool industry reviewed N85-28189
Manufacturing information system
[AD-A152715] N85-28616
MACHINE TRANSLATION
Expressiveness and language choice
[AD-A153280] N85-28623
MACHINING
Steels with improved machinability
[BLL-BISI-22341-(9022.06)] N85-28061
Study of a simulated test for assessing the machinability of steels
[BLL-BISI-TRANS-22344-(9022.06)] N85-28357
Study of a test method for assessing machinability in gear cutting operations
[BLL-BISI-TRANS-22345-(9022.06)] N85-28359
Examples of application of machinability tests
[BLL-BISI-TRANS-22346-(9022.06)] N85-28363
Assessing the machinability of gearwheel steels during manufacture
[BLL-BISI-TRANS-22343-(9902.06)] N85-28365
MAGNESIUM
The effect of microalloying with calcium and magnesium on the plasticity of Poldi AKN 20 Ni-based alloy
[BLL-BISI-TRANS-2174-(9022.06)] N85-28075
MAGNESIUM ALLOYS
Thermal expansion effects in electrical transport in amorphous metals
[AD-A152477] N85-28089
MAGNESIUM COMPOUNDS
Fracture toughness of MgCr(sub)2O(sub)4-ZrO(sub)2
[DE85-007945] N85-27962
MAGNESIUM ISOTOPES
A 200-MeV pi(+) induced nucleon removal from 24Mg N85-28821
MAGNETIC FIELD CONFIGURATIONS
I. F. S. (Institute for Fusion Studies) Newsletter, Volume 4, Number 1
[DE85-007917] N85-28809
Theoretical and numerical studies of magnetic field line displacements in an Elmo Bumpy Torus
[DE85-008757] N85-28816
MAGNETIC FIELDS
The state of martensite after quenching in a magnetic field
[BLL-BISI-TRANS-22297-(9022.06)] N85-28051
Magnetic monopoles
[DE85-008176] N85-28719
Effects of level broadening on the magnetothermal oscillations in two-dimensional electron systems
[AD-A152639] N85-28732
I. F. S. (Institute for Fusion Studies) Newsletter, Volume 4, Number 1
[DE85-007917] N85-28809
Theoretical and numerical studies of magnetic field line displacements in an Elmo Bumpy Torus
[DE85-008757] N85-28816
Central limit theorems in the area of large deviations for some dependent random variables
[AD-A153125] N85-28831
MAGNETIC FLUX
Magnetic flux leakage inspection: Principles and applications
[BLL-BISI-TRANS-22248-(9022.06)] N85-28382
Differential between crack and pseudo-crack indications by means of objective magnetic flux leakage testing
[BLL-BISI-TRANS-22033-(9022.06)] N85-28386
MAGNETIC INDUCTION
Magnetic flux leakage inspection: Principles and applications
[BLL-BISI-TRANS-22248-(9022.06)] N85-28382
MAGNETIC MIRRORS
Stability of high energy particle plasmas to MHD-like modes
[DE85-007879] N85-28803
MAGNETIC MOMENTS
Theoretical studies of high energy phenomenon: Analysis of models of CP and T violation
[DE85-007455] N85-28782
MAGNETIC MONOPOLES
Magnetic monopoles
[DE85-008176] N85-28719
MAGNETIC PERMEABILITY
Optimum dimensions of power solenoids for magnetic suspension
[NASA-TM-77864] N85-28716
MAGNETIC PROBES
Magnetic flux leakage inspection: Principles and applications
[BLL-BISI-TRANS-22248-(9022.06)] N85-28382
MAGNETIC SUSPENSION
Effect of superconducting solenoid model cores on spanwise iron magnet roll control
[NASA-TM-86378] N85-27915
Optimum dimensions of power solenoids for magnetic suspension
[NASA-TM-77864] N85-28716
MAGNETOHYDRODYNAMIC FLOW
Flat magnetohydrodynamic induction pump N85-28145
Dependence of characteristics of centrifugal magnetohydrodynamic conduction pump on electrical conductance of end walls. Part 1: Experiment N85-28146
MAGNETOHYDRODYNAMIC STABILITY
Geophysical plasmas and atmospheric modeling
[AD-A152805] N85-28497
MAGNETOHYDRODYNAMIC WAVES
Solar wind observations associated with a slow forward shock wave at 0.31 AU
[MPAE-W-79-84-46] N85-28909
MAGNETOHYDRODYNAMICS
Fluid modeling of magnetized plasmas
[DE85-007679] N85-28804
MAGNETOSPHERE
IMS (International Magnetospheric Study) contributions to the understanding of auroral precipitation, transport, and particle sources
[AD-A152320] N85-28492
The boundary layers as the primary transport regions of the Earth's magnetotail
[AD-A152714] N85-28496
MAINTENANCE
Inspection evaluation and repair of the flawed feedwater nozzle of the 50 MWe Dodewaard GKN boiling water reactor
[ISBN-90-353-0017-3] N85-28394
Tokamak fusion core experiment maintenance study
[DE85-008040] N85-28813
MALLEABILITY
Assessing the machinability of gearwheel steels during manufacture
[BLL-BISI-TRANS-22343-(9902.06)] N85-28365
MAN MACHINE SYSTEMS
Controller requirements for uncoupled aircraft motion, volume 2
[AD-A153300] N85-27879
Hand controllers for teleoperation. A state-of-the-art technology survey and evaluation
[NASA-CR-175890] N85-28559
Mechanizing of handling operations in drop forging with hammers and presses (conducted ergonomical examinations)
[BMFT-FB-HA-84-051] N85-28561
Efforts at office automation and information systems utilization at Martin Marietta Energy Systems, Incorporated
[DE85-008154] N85-28633
The interface with decision makers in interactive multiobjective linear programming
[REPT-84-38] N85-28637
General laws of development of technology N85-28875
A study of user-defined searching requirements for the on-line version of the directory of DOD-sponsored R and D data bases on the Defense Gateway computer system
[AD-A153000] N85-28878
MANAGEMENT
Central problems in the management of innovation
[AD-A152598] N85-28852
MANAGEMENT INFORMATION SYSTEMS
Manufacturing information system
[AD-A152715] N85-28616
DLA: Data/data base administration analysis
[AD-A153031] N85-28879
MANAGEMENT METHODS
Integrating quality assurance and research and development
[DE85-007974] N85-28392
Future directions in operations research
[REPT-84-24] N85-28711
Multicriteria decision analysis as an aid to strategic planning of energy research and development
[REPT-84-02] N85-28870
MANAGEMENT PLANNING
An examination of alternative forms of fit in contingency theory
[AD-A152602] N85-28853
The concept of fit in contingency theory
[AD-A152603] N85-28854
Documentation for the West German Federal Cabinet's space policy decision N85-28886
MANEUVERS
Design of robust controllers for a multiple input-multiple output control system with uncertain parameters application to the lateral and longitudinal modes of the KC-135 transport aircraft
[AD-A153100] N85-27877
MANGANESE
Influence of manganese and heat treatment on structure and properties of Fe-0.1 percent-C-14 percent Cr-based steels
[BLL-BISI-TRANS-22299-(9022.06)] N85-28071
Part played by non-metallic inclusions during deformation and fracture of steel with different grain sizes
[BLL-BISI-TRANS-22321-(9022.06)] N85-28072
Temperature and manganese content dependences of tensile deformation in iron-high manganese binary alloys
[DE85-007656] N85-28098
MANGANESE ALLOYS
Mechanical stabilization of austenite against epsilon martensite and its effect on deformation behavior in high manganese steels
[DE85-007654] N85-28097
MANGANESE OXIDES
Influence of eutectic silicate inclusions on micro-processes during deformation and fracture of 12GS steel
[BLL-BISI-TRANS-22296-(9022.06)] N85-28073
MANIFOLDS (MATHEMATICS)
Special relativity of Kaluza-Klein
[DE85-007838] N85-28847
MANNED ORBITAL LABORATORIES
European utilization aspects of a US manned space station, volume 1
[ESA-CR(P)-1987-VOL-1] N85-27926
European utilization aspects of a US manned space station, volume 2
[ESA-CR(P)-1987-VOL-2] N85-27927
MANNED SPACECRAFT
Descent vehicles
[NASA-TM-77654] N85-27933
MANOMETERS
NMR manometer for measuring high pressures at liquid-helium temperatures N85-28171
MANUFACTURING
Physio-chemical mechanisms of the processes of the formation of globular inclusions in ball-bearing metal
[BLL-BISI-TRANS-22235-(9022.06)] N85-28030
Uses of, experiences in production of custom designed IC's N85-28180
Modern equipment for manufacture of IC's in Hungary N85-28181
Robots, automatic devices inside VW's Wolfsburg plant N85-28186
Future directions of robotics, automation in Italy N85-28187
Application of 4-wire submerged arc method to welding UOE pipe
[BLL-BISI-TRANS-22417-(9022.06)] N85-28358
Production of electrically welded tubes with removed internal flash
[BLL-BISI-TRANS-22382-(9022.06)] N85-28367
Future of ceramic turbochargers: Promises and pitfalls
[DE85-006209] N85-28380

Principal quality assurance measures in the manufacture of HF-welded high-pressure linepipe
[BLL-BISI-TRANS-21690-(9022.06)] N85-28389

MAPPING
Microwave responses of the western North Atlantic
[NASA-CR-175888] N85-28191
Evaluation of Defense Mapping Agency level 1 second edition digital data for training simulator applications
[AD-A152444] N85-28437
Boundary to constructive solid geometry mapings: A focus on 2-D issues N85-28570

MARINE BIOLOGY
Towards a study of synoptic-scale variability of the California current system
[NASA-CR-175871] N85-28529

MARINE ENVIRONMENTS
Fatigue of synthetic fibers for marine rope applications
[MIT-R84-2] N85-28414

MARINE PROPULSION
USSR report: Engineering and equipment
[JPRS-UEQ-85-004] N85-28142

MARKETING
The Ariane launch vehicle is the key of the Europeans to the space market N85-27931

MARKOV PROCESSES
Theory of laser-stimulated surface process. 2: A generalized-master-equation approach to energy transfer between an IR laser, an aspecties and phonons
[AD-A153083] N85-28344
On estimating transition intensities of a Markov process with aggregate data of a certain type
[CWI-MS-R8411] N85-28707
Maximum flow in planar networks with exponentially distributed arc capacities
[AD-A153158] N85-28710

MARTENSITE
The state of martensite after quenching in a magnetic field
[BLL-BISI-TRANS-22297-(9022.06)] N85-28051
The structure of carbon martensite analyzed with Moessbauer spectra
[BLL-BISI-TRANS-22402-(9022.06)] N85-28062
Mechanical stabilization of austenite against epsilon martensite and its effect on deformation behavior in high manganese steels
[DE85-007654] N85-28097
Fatigue crack propagation characteristics and fatigue fracture toughness in 780 MPa grade high strength steel weldments at low temperature
[BLL-BISI-TRANS-22369-(9022.06)] N85-28411

MARTENSITIC TRANSFORMATION
Textural transformations taking place during heat and mechanical treatment in triplex steels
[BLL-BISI-TRANS-22404-(9022.06)] N85-28063
Influence of structural state and alloy content of austenite on formation of martensitic phases in steels
[BLL-BISI-TRANS-22385-(9022.06)] N85-28068

MASER OUTPUTS
Electron-cyclotron maser emission during solar and stellar flares
[NASA-CR-175883] N85-28907

MASERS
The superconducting cavity stability ruby maser oscillator N85-28324

MASS
The role of thermal motions of air particles for fireballs
[PUBL-59] N85-28900

MASS SPECTROSCOPY
Photoionization mass spectrometry with VUV hydrogen laser source
[AD-A153382] N85-28009
Resonance ionization mass spectrometry of carbon
[DE85-009040] N85-28018
Morphological stability and fluid dynamics of vapor crystal growth
[NASA-CR-175879] N85-28822

MASS TRANSFER
Stefan-Maxwell relations for plasma diffusion currents in magnetic field N85-28160
Transport in aqueous battery systems
[DE85-007248] N85-28251
CALTECH-DOE program on numerical analysis, computing and fundamental studies of motion, energy and mass transfer in fluids
[DE85-008106] N85-28274
Molten carbonate fuel cell performance model update
[DE85-003356] N85-28454

MATCHING
Further study of digital matching of dissimilar images
[AD-A153112] N85-28672

MATERIALS HANDLING
Technological apparatus for laser treatment of materials N85-28174

MATERIALS RECOVERY
Michelle-derived catalysts for extended Schulz-Flory
[DE85-005656] N85-28012

MATHEMATICAL MODELS
An introduction to vortex breakdown and vortex core bursting
[NAE-AN-28] N85-27829
Parameter identification results of tests in nonsteady symmetric flight with the Hawker Hunter Mk 7
[NLR-TR-83042-U] N85-27860
Mathematical modeling and control of a large space structure as applied to a shuttle-antenna configuration
[AD-A153269] N85-27939
Composite loads spectra for select space propulsion structural components: Probabilistic load model development N85-27954
Hydrogen embrittlement of high-strength steel
[B8580075] N85-28103
Navier-Stokes computational study of axisymmetric transonic turbulent flows with a two-equation model of turbulence
[AD-A152653] N85-28265
Coherent structure reflective turbulent viscous flow modeling
[AD-A153086] N85-28267
Statistical models used in analyzing the quality of welded tubes
[BLL-BISI-TRANS-22232-(9022.06)] N85-28384
Earth observation modeling based on layer scattering matrices
[NLR-MP-84015-U] N85-28440
Simplified analysis of Stirling engines and heat pumps
[DE85-008753] N85-28457
Two-dimensional inverse kinematic problem: Application to the Saudi Arabian refraction profile N85-28478
Crustal structure of the Red Sea-Arabian Shield transition N85-28479
A crustal section for the Arabian Shield and adjacent Red Sea margin derived from first-arrival data N85-28480
A seismic refraction profile across the Arabian Shield N85-28481
A preliminary examination of the 1978 refraction profiles in Saudi Arabia N85-28482
A comparison of crustal sections: Arabian Shield to the Red Sea N85-28491
Solar radiance models for determination of ERBE scanner filter factor
[NASA-CR-172595] N85-28513
Presentations at the Tri-Service Cloud Modeling Workshop (2nd), held at the Naval Surface Weapons Center, White Oak, Maryland, 26-27 June 1984, volume 1
[AD-A152735] N85-28522
Parameterization of subgrid-scale fluxes in mesoscale meteorological models
[AD-A153016] N85-28523
Mathematical modeling and simulation of climate and climatic change
[DE85-008974] N85-28526
A new technique for system-to-system transfer of surface data N85-28589
Optical phenomena in computer vision
[AD-A152970] N85-28595
A discussion of adaptive grids and their applicability in numerical hydrodynamic modeling
[AD-A151843] N85-28659
Deconvolution methods for multi-sensors
[AD-A152351] N85-28660
Echo-response from crack-like two-dimensional reflectors in focused ultrasonic fields N85-28724
Kirchhoff modeling via wave equation datuming
[AD-A152399] N85-28727
Light scattering by leaf layers with application to canopy reflectance modeling: The Scattering by Arbitrarily Inclined Leaves (SAIL) model
[NLR-MP-84011-U] N85-28796
Analysis of nonlinear parabolic equations modeling plasma diffusion across a magnetic field
[DE85-007683] N85-28807

MATRICES (MATHEMATICS)
A method to calculate the parameters of wings of arbitrary planform
[AD-A152689] N85-27831
Discrete mathematics for communications systems
[AD-A152814] N85-28664
Robust tests of mean vector in symmetrical multivariate distributions
[AD-A153116] N85-28674
Symbolic Givens reduction in large sparse least squares problems
[DE85-006685] N85-28681
On the condition number of modified moment matrices arising from least squares approximation in the complex plane
[AD-A152353] N85-28714

MATTER (PHYSICS)
Particle physics: Recent successes and future prospects
[DE85-008175] N85-28765

MAXIMUM LIKELIHOOD ESTIMATES
Nonsmooth analysis and Frechet differentiability of M-functionals
[AD-A152932] N85-28668

MEASURE AND INTEGRATION
Relaxation methods for hyperbolic equations
[REPT-84-20] N85-28687

MEASURING INSTRUMENTS
Uniaxial angular accelerometers N85-28173
Apparatus for measuring velocity of sound in fluids N85-28175
Technique for measuring the effective source reflection coefficient of 2-resistor power splitters
[DE85-009964] N85-28256

MECHANICAL DRIVES
Vibrations of rotors connected through couplings with backlash N85-28147

MECHANICAL PROPERTIES
New materials and techniques for aircraft structures
[B8580074] N85-27861
Mechanical properties of polycrystalline alpa titanium
[BLL-BISI-TRANS-21923-(9022.06)] N85-28029
Thermomechanical treatment aimed at the protection of type 316 stainless steel from IGC and IGSCC
[BLL-BISI-TRANS-22498-(9022.06)] N85-28040
The synergistic actions of stress corrosion cracking and corrosion fatigue
[BLL-BISI-TRANS-22334-(9022.06)] N85-28045
Improving the properties of copper and copper alloys through heat treatment and alloying
[BLL-BISI-TRANS-21939-(9022.06)] N85-28047
Steels with improved machinability
[BLL-BISI-22341-(9022.06)] N85-28061
Microstructure and mechanical properties of rare-earths-microalloyed high-speed tool steel
[BLL-BISI-TRANS-22043-(9022.06)] N85-28064
Physical properties of steels and their temperature dependence
[BLL-BISI-TRANS-22285-(9022.06)] N85-28065
Influence of composition on the microstructural evolution and mechanical properties of irradiated Fe-Ni-Cr ternaries
[DE85-007462] N85-28094
USSR report: Engineering and equipment
[JPRS-UEQ-85-004] N85-28142
Conformational and mechanical properties at high strain rates
[AD-A153401] N85-28272
Examination of the regions of the joint of sheets bonded by the explosive welding technique
[BLL-BISI-TRANS-22352-(9022.06)] N85-28370
Tests of low-cycle fatigue of elected steels of class 11
[BLL-BISI-TRANS-22039-(9022.06)] N85-28404
Radiation damage experiments and lifetime estimates for beryllium components in fusion systems
[DE85-008038] N85-28811

MECHANIZATION
USSR report: Science and technology policy
[JPRS-UST-85-006] N85-28872

MEDIAN (STATISTICS)
A multiple regression technique for detecting outliers
[REPT-84-33] N85-28706

MELTING
The influence of melting practice and of microalloying, with rare earth metals and with boron, on the quality of low-carbon steel
[BLL-BISI-22487-(9022.06)] N85-28036
Influence of temperature in melting and casting on quality of medium-alloy steel
[BLL-BISI-TRANS-22310-(9002.06)] N85-28137
Modern sedimentation in the northern Barents Sea: Input, dispersal and deposition of suspended sediments from glacial meltwater
[AD-A152520] N85-28530

MELTING POINTS
Fuel freeze point investigations
[AD-A152801] N85-28129
Radar study of the melting layer
[ESA-CR(P)-1974] N85-28527

MELTS (CRYSTAL GROWTH)
A Navier-Stokes capillary free boundary in open boat crystal growth
[REPT-84-34] N85-28283

MEMORY
The levels of processing conceptualization of human memory: Some empirical and theoretical issues
[AD-A152321] N85-28544
Distributed memory
[AD-A153364] N85-28554

MENTAL PERFORMANCE
Performance Evaluation Tests for Environmental Research (PETER) evaluation of 112 measures
[AD-A152317] N85-28543
The levels of processing conceptualization of human memory: Some empirical and theoretical issues
[AD-A152321] N85-28544
Oral discussion, group-to-individual transfer and achievement in cooperative learning groups
[AD-A153209] N85-28552
MERCURY (METAL)
Adsorption of Hg on lunar samples
[DE85-007948] N85-28906
MERCURY CADMIUM TELLURIDES
Properties of defects in Hg(1-x)Cd(x)Te
[AD-A153243] N85-28835
MESH
Montonicity preserving bicubic interpolation, revision 1
[DE85-007976] N85-28683
MESONS
Proposal for the systematic naming of mesons and baryons
[DE85-006453] N85-28773
MESOSCALE PHENOMENA
Convective storm downdraft outflows detected by NASA/MSFC's Airborne 10.6 micron pulsed Doppler Lidar System
[NASA-CR-3898] N85-28511
MESSAGE PROCESSING
Distributed matchmaking for processes in computer networks
[CWI-CS-R8421] N85-28652
METAL BONDING
New process for production of bimetal with corrosion-resistant cladding layer
[BLL-BISI-TRANS-22371-(9022.06)] N85-28056
METAL COATINGS
Forming of coating protection system: Mechanism of paint-coating anti-corrosion protection of steel
[BLL-BISI-TRANS-22081-(9022.06)] N85-28033
METAL CUTTING
Study of a test method for assessing machinability in gear cutting operations
[BLL-BISI-TRANS-22345-(9022.06)] N85-28359
METAL DRAWING
New method for determining stampability of sheet materials
[BLL-BISI-22486-(9022.06)] N85-28360
METAL FATIGUE
Reaction-bonded and fiber-reinforced SiC static and dynamic gas turbine components
[BMFT-FB-T-84-302] N85-27874
Role of hydrogen and structure on CMSX-2 N85-27967
The synergistic actions of stress corrosion cracking and corrosion fatigue
[BLL-BISI-TRANS-22334-(9022.06)] N85-28045
X-ray diffraction study of changes in stress-strain distributions during fatigue of a 2-phase alloy
[AD-A152367] N85-28087
Development of high temperature resistant, noncorrosible, non-metallic ceramic materials, especially silicon nitride in gas turbine application
[BMFT-FB-T-85-015] N85-28125
Development of high temperature resistant noncorrodible silicon carbide components for gas turbine applications, follow-up report
[BMFT-FB-T-85-016] N85-28126
The fatigue properties of welds at low temperature, according to the type of steel
[BLL-BISI-TRANS-22455-(9022.06)] N85-28410
METAL FIBERS
Production and compaction of amorphous metal powders
[BLL-BISI-TRANS-22367-(9022.06)] N85-28080
Research on design of cryotransformers and its prospects for the future
[AD-A152400] N85-28230
METAL FINISHING
Kinetics of the formation of a complex alloyed boride coating on iron and its properties
[BLL-BISI-TRANS-22303-(9022.06)] N85-28084
METAL MATRIX COMPOSITES
Titanium metal-matrix composites
[AD-D011643] N85-28086
METAL OXIDE SEMICONDUCTORS
Completely consumed carbide: A new process for dielectric isolation
[AD-A152379] N85-27987
Self-scanning MDS-integrated photosensor strip N85-28151
Goals, achievements of microelectronics program N85-28179
VLSI workshop and project: February - November 1982
[WSRL-0374-TR] N85-28223
Random access memory technologies
[AD-A153089] N85-28597
METAL PARTICLES
The enhancement of molecular fluorescence and photochemistry by small metal particles
[AD-A152740] N85-27994
METAL PLATES
Formation of a fine structure during shock wave welding
[BLL-BISI-TRANS-22401-(9022.06)] N85-28368
METAL POWDER
Electrodes for flash discharge lamps
[DE85-008897] N85-28250
METAL SHEETS
Examination of the regions of the joint of sheets bonded by the explosive welding technique
[BLL-BISI-TRANS-22352-(9022.06)] N85-28370
METAL SHELLS
Dynamic creep buckling: Analysis of shell structures subjected to time-dependent mechanical and thermal loading N85-27959
METAL WORKING
USSR report: Machine tools and metalworking equipment
[JPRS-UMM-84-014] N85-28188
New method for determining stampability of sheet materials
[BLL-BISI-22486-(9022.06)] N85-28360
State of stress and penetration of plastic deformation in forming
[BLL-BISI-22199-(9022.06)] N85-28396
METAL-METAL BONDING
New examples of clusters, extended metal-metal bonding and interstital derivatives
[DE85-005926] N85-28837
METALLIC GLASSES
Vibrational spectra of a-Fe(.78)P(.22) by inelastic neutron scattering
[DE85-008298] N85-28016
METALLIZING
Metallurgical means of preventing the corrosion of metal
[BLL-BISI-TRANS-22320-(9022.06)] N85-28082
METALLOGRAPHY
Physio-chemical mechanisms of the processes of the formation of globular inclusions in ball-bearing metal
[BLL-BISI-TRANS-22235-(9022.06)] N85-28030
Quality testing to the specifications of the Stahl-Eisen-Pruefblatt 1570/71 using an automatic image analysis system
[BLL-BISI-TRANS-22253-(9022.06)] N85-28385
METALLURGY
Metallurgical means of preventing the corrosion of metal
[BLL-BISI-TRANS-22320-(9022.06)] N85-28082
METALS
Thermal expansion effects in electrical transport in amorphous metals
[AD-A152477] N85-28089
Electrons and grain boundary energies in metals
[DE85-009530] N85-28099
Limiting values of stress state index after rupture of metals
[BLL-BISI-TRANS-22293-(9022.06)] N85-28407
The effect of ion-bombardment-induced atomic mixing on depth-profiling of interfaces
[AD-A153199] N85-28834
Thermodynamic calculations of equilibrium states in metal-carbon-hydrogen-oxygen system
[BLL-BISI-TRANS-22092-(9022.06)] N85-28844
METEORITES
The role of thermal motions of air particles for fireballs
[PUBL-59] N85-28900
METEOROLOGICAL FLIGHT
Airborne research meteorological data collected by the National Hurricane Research Laboratory (Hurricane Research Division/AOML) during the 1982-1983 hurricane seasons: Inventory and availability
[PB85-163681] N85-28528
METEOROLOGICAL INSTRUMENTS
Snow Scale/Rate meter
[AD-D011648] N85-28505
METEOROLOGICAL PARAMETERS
Investigation of air pollution impact in Eastern Bavaria: Measurement results from August and September, 1984
[DFVLR-FB-85-03] N85-28471
Functional and performance requirements of the next NOAA-Kasas City computer system N85-28510
Air Weather Service (AWS) climatic briefs: Europe
[AD-A152528] N85-28519
Radar study of the melting layer
[ESA-CR(P)-1974] N85-28527
METEOROLOGICAL RADAR
Statistical comparison of radar echoes of convective precipitation between the northern Alps and its foreland
[DFVLR-FB-85-07] N85-28215
Weather radar studies
[AD-A152563] N85-28521
Radar study of the melting layer
[ESA-CR(P)-1974] N85-28527
METEOROLOGICAL RESEARCH AIRCRAFT
Three powered sailplanes as meteorological instrumentation for atmospheric boundary layer studies at DFVLR
[DFVLR-FB-84-50] N85-27862
DFVLR measuring system for the determination of the spatial distribution of environmental parameters of the atmosphere by means of mobile instrumented platforms
[DFVLR-FB-85-09] N85-28472
Airborne research meteorological data collected by the National Hurricane Research Laboratory (Hurricane Research Division/AOML) during the 1982-1983 hurricane seasons: Inventory and availability
[PB85-163681] N85-28528
METEOROLOGICAL SERVICES
Meteorology and food production: The theme of the 16 meteorology day
[AD-A152372] N85-28518
METEOROLOGY
Developments in the area of air traffic control systems and the relation with meteorology
[NLR-MP-84029-U] N85-27848
Air Weather Service (AWS) climatic briefs: Europe
[AD-A152528] N85-28519
Airborne research meteorological data collected by the National Hurricane Research Laboratory (Hurricane Research Division/AOML) during the 1982-1983 hurricane seasons: Inventory and availability
[PB85-163681] N85-28528
METHANE
Fatty and aromatic acid catabolizing bacteria from methanogenic ecosystems
[DE85-008133] N85-28537
METHYL ALCOHOLS
Methanol adsorption on Pt(111)
[DE85-006802] N85-28017
Conversion of methanol to gasoline: Engineering and construction of the demonstration plant
[DE85-003237] N85-28133
METHYLENE BLUE
The electrochemistry of azine, oxazine and thiazine dyes
[AD-A152394] N85-27990
METRIC SPACE
The definition and computation of a metric on plane curves. The meaning of a face on a geometric model N85-28571
METROLOGY
Methods for optimal recursive estimation of non-stationary time series, applications to atomic time and frequency metrology N85-28312
MICHELSON INTERFEROMETERS
Special topics in infrared interferometry — Michelson interferometer development
[NASA-TM-87472] N85-28794
MICROCOMPUTERS
Ultrasonic flaw detector with microcomputer interpretation
[BMFT-FB-T-84-272] N85-28395
Microcomputer-controlled system for measuring atmospheric particle fluxes
[DE85-007910] N85-28489
Microprocessor controlled temperature chassis
[DE85-008392] N85-28602
A programming system for a modular flexible multimicrocomputer system for the automatic control of automated test equipment
[JUEL-1962] N85-28641
MICROELECTRONICS
East Europe report: Science and technology
[JPRS-ESA-85-017] N85-28177
Goals, achievements of microelectronics program N85-28179
West Europe report: Science and technology
[JPRS-WST-84-024] N85-28183
Present status of physics research in Spain: Some impressionistic remarks
[AD-A152455] N85-28718
MICROPROCESSORS
Development of a microprocessor controlled communication system for ships
[BMFT-FB-T-84-275] N85-28216
VLSI (Very large scale integrated circuits) device reliability models
[AD-A153268] N85-28245
Microprocessor controlled temperature chassis
[DE85-008392] N85-28602
Development of a multiprocessor system, using the MOTORLA microprocessor 6809, with the aim of providing maximum flexibility in the design of individual control devices
[BMFT-FB-T-84-270] N85-28607

MICROSCOPY
A micrographic and gravimetric study of intercalation and deintercalation of graphite fibers
[NASA-TM-87026] N85-28110
MICROSTRUCTURE
Constitutive cyclic deformation behavior in single-crystal and directionally solidified SSME high-pressure fuel turbopump airfoil materials N85-27965
Study of self-propagating condensed phase reactions TiB(2) synthesis
[AD-A153198] N85-28006
Powder-metallurgy alloys and steels
[BLL-BISI-TRANS-22239-(9022.06)] N85-28050
Textural transformations taking place during heat and mechanical treatment in triplex steels
[BLL-BISI-TRANS-22404-(9022.06)] N85-28063
Microstructure and mechanical properties of rare-earths-microalloyed high-speed tool steel
[BLL-BISI-TRANS-22043-(9022.06)] N85-28064
Preventing the formation of an anomalous structure in chemically sealed low carbon steel
[BLL-BISI-TRANS-22373-(9022.06)] N85-28085
Influence of composition on the microstructural evolution and mechanical properties of irradiated Fe-Ni-Cr ternaries
[DE85-007462] N85-28094
Properties of nitrogen containing stainless alloy designed for high resistance to pitting
[DE85-006282] N85-28095
Mechanical stabilization of austenite against epsilon martensite and its effect on deformation behavior in high manganese steels
[DE85-007654] N85-28097
Microstructure-mechanical property relationships in transformation-toughened ceramics
[DE85-009722] N85-28117
Submerged arc welding of new Czechoslovak micro-alloy steels
[BLL-BISI-TRANS-22193-(9022.06)] N85-28356
Formation of a fine structure during shock wave welding
[BLL-BISI-TRANS-22401-(9022.06)] N85-28368
MICROWAVE AMPLIFIERS
The design of megawatt gyrotrons
[DE85-007892] N85-28754
MICROWAVE CIRCUITS
Measurement methods for accurate microwave characterization and modeling of MESFET chips
[AD-A152360] N85-28227
Communications and logic systems at millimeter wave frequencies
[NASA-CR-175859] N85-28824
MICROWAVE EQUIPMENT
Design of the waveguide for microwave heating of solid lithium ceramic blankets
[DE85-009776] N85-28120
Technique for measuring the effective source reflection coefficient of 2-resistor power splitters
[DE85-009964] N85-28256
VULTURE manual
[DE85-008873] N85-28631
MICROWAVE IMAGERY
Microwave responses of the western North Atlantic
[NASA-CR-175888] N85-28191
MICROWAVE LANDING SYSTEMS
Developments in the area of air traffic control systems and the relation with meteorology
[NLR-MP-84029-U] N85-27848
MICROWAVES
Microwave responses of the western North Atlantic
[NASA-CR-175888] N85-28191
Microwave experimental studies of laser fusion
[DE85-008327] N85-28814
MILITARY AIRCRAFT
Operations research
[B8561897] N85-28712
MILITARY TECHNOLOGY
Science and Technology in the Soviet Union
[AD-A152828] N85-28856
Soviet weapons development and the scientific community
[AD-P004562] N85-28857
Technology and technical efficiency in the Soviet Union: Dominant patterns of constrained optimization in a noncompetitive economic regime
[AD-P004567] N85-28862
The revolution in military affairs and the Soviet system
[AD-P004568] N85-28863
MILLIMETER WAVES
Radiometer integrated into a communication terminal
[AD-A151746] N85-28195
A transport theory of millimeter wave propagation in woods and forests
[AD-A151883] N85-28196
High precision materials characterization in the near millimeter wave-length range
[AD-A153267] N85-28331
Communications and logic systems at millimeter wave frequencies
[NASA-CR-175859] N85-28824
MILLING MACHINES
Microstructure and mechanical properties of rare-earths-microalloyed high-speed tool steel
[BLL-BISI-TRANS-22043-(9022.06)] N85-28064
The application of numerical control (NC) in manufacturing wind tunnel models
[B8580078] N85-28140
MIM DIODES
Research and developmental study on MIS thin film solar cells of amorphous hydrogenated silicon, part 2
[BMFT-FB-T-84-290] N85-28467
MINERAL DEPOSITS
Yearbook of the Bureau of Mineral Resources, Geology and Physics: Geoscientific research, resource assessment, and database development, 1 Jul. 1983 to 30 Jun. 1984
[BMR-84] N85-28474
MINERALS
Process for clarification of water
[DE85-007864] N85-28023
MINIMAX TECHNIQUE
Robust tests of mean vector in symmetrical multivariate distributions
[AD-A153116] N85-28674
MINKOWSKI SPACE
Special relativity of Kaluza-Klein
[DE85-007838] N85-28847
MIRROR FUSION
Stability of high energy particle plasmas to MHD-like modes
[DE85-007879] N85-28803
An Impurity Control Test Facility (ICTF) for the study of fusion reactor/plasma edge materials
[DE85-007946] N85-28810
Energy and Technology Review
[DE85-004358] N85-28868
MISSION PLANNING
Shuttle-tethered satellite system definition study extension
[NASA-CR-171473] N85-27923
MIXING
A bilaterally deterministic rho-mixing stationary random sequence
[AD-A152656] N85-28666
The effect of ion-bombardment-induced atomic mixing on depth-profiling of interfaces
[AD-A153199] N85-28834
MIXING CIRCUITS
Communications and logic systems at millimeter wave frequencies, summary N85-28825
MIXTURES
Application of scattering methods to the studies of the structure of polymer blends
[IFPR-13/1984] N85-28104
MOBILE COMMUNICATION SYSTEMS
Moon bounce communications to small terminals
[AD-A153297] N85-28212
MOBILITY
Hall mobility in fluid argon
[DE85-007268] N85-28840
MODELS
Airport and airway system cost allocation model. Volume 7: User's manual
[AD-A152877] N85-27917
Composite loads spectra for select space propulsion structural components N85-27953
One-dimensional velocity-depth functions determined for the Arabian Shield and the southwestern Red Sea: A comparison of models N85-28490
The definition and computation of a metric on plane curves. The meaning of a face on a geometric model N85-28571
Improving the effectiveness of integral property calculation in a CSG solid modeling system by exploiting predictability N85-28586
Generation and display apparatus
[AD-D011639] N85-28599
The design of megawatt gyrotrons
[DE85-007892] N85-28754
Experimental methods of heavy quark detection
[DE85-006316] N85-28781
MODERATORS
Radiation damage experiments and lifetime estimates for beryllium components in fusion systems
[DE85-008038] N85-28811
MODULARITY
A modular dissimilar redundant computer designed for high integrity control N85-27904
MODULATION
Rational pulse-shaping filters for almost MSK-like modulation
[AD-A153065] N85-28208
Moon bounce communications to small terminals
[AD-A153297] N85-28212
MODULATORS
Spatial light modulator having a capacitively coupled photoconductor
[AD-D011646] N85-28790
MODULES
Operating characteristics of a 0.87 kW-hr
[NASA-TM-87038] N85-28371
CAMAC 488 module: 68000 based GPIB interface module
[DE85-009367] N85-28635
MODULUS OF ELASTICITY
Natural vibrations of reinforced spherical shells N85-28165
MOLECULAR BEAM EPITAXY
Communications and logic systems at millimeter wave frequencies, summary N85-28825
MOLECULAR BIOLOGY
The cosmic history of the biogenic elements and compounds
[NASA-SP-476] N85-28562
MOLECULAR COLLISIONS
Large, energetic cluster impacts on surfaces
[DE85-006559] N85-28769
MOLECULAR EXCITATION
Electronically excited alkaline earth oxides: Chemical production and collisional energy transfer processes
[AD-A153172] N85-28833
MOLECULAR OSCILLATORS
Construction techniques of a molecular hydrogen laser
[AD-A152928] N85-28349
MOLECULAR ROTATION
Rotational relaxation studies of hydrogen fluoride
[AD-A152711] N85-28734
MOLECULAR STRUCTURE
An investigation of molecular structure of copolymers using positron annihilation spectroscopy
[NASA-TM-86431] N85-27977
Detailed chemical kinetic study of the effect of molecular structure on autoignition of fuel-air mixtures
[DE85-004424] N85-28010
Electroweak interactions in nuclei
[DE85-007811] N85-28762
MOLECULES
Experimental study of dissociative attachment in optically-pumped lithium molecules
[AD-A152800] N85-28738
Spectroscopy of surface adsorbed molecules
[DE85-009452] N85-28768
MOLYBDENUM
Influence of heat treatment parameters on the properties of induction hardened Ni-Cr-Mo steels
[BLL-BISI-TRANS-2499-(9022.06)] N85-28053
Influence of temperature in melting and casting on quality of medium-alloy steel
[BLL-BISI-TRANS-22310-(9902.06)] N85-28137
Study of a simulated test for assessing the machinability of steels
[BLL-BISI-TRANS-22344-(9022.06)] N85-28357
MOLYBDENUM ALLOYS
Study to optimize Cr-Mo steels to resist hydrogen and temper embrittlement
[DE85-005492] N85-28096
MOMENTUM
Coherent state description of non-topological solitons and momentum projection
[DE85-007814] N85-28761
MONITORS
Results from radiation monitoring equipment experiment on STS-8
[AD-A153241] N85-28911
MONKEYS
Encapsulation and packaging of a semiconductor multielectrode array for cortical implantation
[AD-A153180] N85-28535
MONOPROPELLANTS
Liquid propellants for use in guns: A review
[AD-A153051] N85-28131
MONOPULSE RADAR
Angular tracking error in A phase comparison monopulse tracking radar: A critical review and extension of the phase front distortion approach
[AD-A152628] N85-28205
MONOTONE FUNCTIONS
When is a Bernstein-Bezier curve the graph of a function? N85-28568
MONTE CARLO METHOD
Adding computationally efficient realism to Monte Carlo turbulence simulation
[NASA-TP-2469] N85-28708

Incorporation of Monte Carlo electron interface studies into photon general cavity theory
[DE85-007674] N85-28772
Lattice actions improved by block-spin renormalisation group and maximally symmetric lattices
[DE85-007416] N85-28841

MOON
Moon bounce communications to small terminals
[AD-A153297] N85-28212
Analytical generation of satellite orbits at the RAE (Royal Aircraft Establishment)
[AD-A152655] N85-28901
Adsorption of Hg on lunar samples
[DE85-007948] N85-28906

MORPHOLOGY
The state of martensite after quenching in a magnetic field
[BLL-BISI-TRANS-22297-(9022.06)] N85-28051
Application of scattering methods to the studies of the structure of polymer blends
[IFPR-13/1984] N85-28104
Morphological stability and fluid dynamics of vapor crystal growth
[NASA-CR-175879] N85-28822
Morphological stability and fluid dynamics of vapor crystal growth
[NASA-CR-175880] N85-28823

MOSSBAUER EFFECT
The structure of carbon martensite analyzed with Moessbauer spectra
[BLL-BISI-TRANS-22402-(9022.06)] N85-28062

MOUNTAINS
Structural analysis of terrane accretions in the eastern Brooks Range and adjacent areas in central Alaska and Canada
[DE85-008279] N85-28501

MOUNTING
Support structures for optical components in the Laser Demonstration Facility
[DE85-008879] N85-28349

MOVING TARGET INDICATORS
Techniques for operating Charge Coupled Devices (CCD's) in very high speed framing mode
[AD-A152878] N85-28238

MULTIPROCESSING (COMPUTERS)
A modular dissimilar redundant computer designed for high integrity control N85-27904
Development of a multiprocessor system, using the MOTORLA microprocessor 6809, with the aim of providing maximum flexibility in the design of individual control devices
[BMFT-FB-T-84-270] N85-28607
Real-Time Multiprocessor Programming Language (RTMPL) user's manual
[NASA-TP-2422] N85-28610
Parallel Cholesky factorization on a multiprocessor
[DE85-008762] N85-28682

MULTIPROGRAMMING
Research in computer science
[NASA-CR-175922] N85-28612

MULTISPECTRAL BAND SCANNERS
Thermal Infrared Multispectral Scanner (TIMS): An investigator's guide to TIMS data
[NASA-CR-175875] N85-28286
An assessment of the potential role of multispectral imagery in bathymetric charting
[AD-A152460] N85-28438

MULTIVARIATE STATISTICAL ANALYSIS
Analysis of control system from a viewpoint of desired pole placement and desired degree of robustness
[AD-A152627] N85-27876
An empirical comparison of the accuracy of univariate and multivariate corrections for range restriction
[AD-A153071] N85-28670

MUON SPIN ROTATION
Activities of the Solid State Physics Research Institute
[NASA-CR-175899] N85-28818
Muon spin rotation studies N85-28819

MUONS
Uniaxial stress induced symmetry breaking for muon sites in Fe N85-28820

N

NAMING
Proposal for the systematic naming of mesons and baryons
[DE85-008453] N85-28773

NASA PROGRAMS
European utilization aspects of a US manned space station, volume 1
[ESA-CR(P)-1967-VOL-1] N85-27926
European utilization aspects of a US manned space station, volume 2
[ESA-CR(P)-1967-VOL-2] N85-27927
Summer High School Apprenticeship Research Program (SHARP) of the National Aeronautics and Space Administration
[NASA-CR-175791] N85-28849
National Aeronautics and Space Administration Authorization Act, 1986
[S-REPT-99-91] N85-28885

NATIONAL AIRSPACE SYSTEM
National airspace review, change 1
[AD-A152369] N85-27844

NATURAL LANGUAGE (COMPUTERS)
Language design, computers and brains
[AD-A152619] N85-28594

NAVIER-STOKES EQUATION
Users manual for coordinate generation code CRDSRA
[NASA-CR-172584] N85-27824
User's manual for airfoil flow field computer code SRAIR
[NASA-CR-172585] N85-27825
Use of quaternions in flight mechanics
[AD-A152616] N85-27875
Navier-Stokes computational study of axisymmetric transonic turbulent flows with a two-equation model of turbulence
[AD-A152653] N85-28265
Proceedings of the 9th US Air Force and the Federal Republic of Germany Data Exchange Agreement Meeting, Viscous and Interacting Flow Field Effects
[AD-A153020] N85-28266
A Navier-Stokes capillary free boundary in open boat crystal growth
[REPT-84-34] N85-28283

NAVIGATION
Avionics data base
[AD-A152415] N85-27863

NAVIGATION AIDS
Avionics data base
[AD-A152415] N85-27863

NAVIGATION SATELLITES
Scintillation using NNSS satellites
[AD-A152804] N85-28207

NAVSTAR SATELLITES
Real-time position determinations using the GPS TI4100/GEOSTAR receiver
[AD-A152551] N85-27845
Kalman filter estimates of the NAVSTAR satellite clock parameters N85-28315

NAVY
Navy geothermal plan
[AD-A152478] N85-28450

NEAR FIELDS
High precision materials characterization in the near millimeter wave-length range
[AD-A153267] N85-28331

NEGATIVE IONS
A study of excitations during collisionally-induced electron detachment of negative ions
[AD-A152879] N85-28739

NETHERLANDS
Rotterdam Airport and the Common Market N85-27840
Water quantity and quality research for the Rhine Meuse estuary
[PUBL-325] N85-28470
Observations of surface water temperature in the Netherlands since 1860: Statistics
[KNMI-WR-84-3] N85-28531
Observations of surface water temperature in the Netherlands since 1860: Tables for light vessels
[KNMI-WR-84-4] N85-28532
Observations of surface water temperature in the Netherlands since 1860: Series from KNMI-RWS
[KNMI-WR-84-5] N85-28533

NETS
Spline curves, wire frames and B-value N85-28587

NETWORK ANALYSIS
Algebra of communicating processes
[CWI-CS-R8421] N85-28214
Defense data network support concept analysis
[AD-A153214] N85-28649
Numerical methods for stiff ordinary and elliptic partial differential equations
[AD-A153247] N85-28675
Maximum flow in planar networks with exponentially distributed arc capacities
[AD-A153158] N85-28710

NETWORK CONTROL
Distributed elections in a ring of processors using Archimedean time
[CWI-CS-R8416] N85-28653

NEURAL NETS
Distributed memory
[AD-A153364] N85-28554

NEUROLOGY
Academician Ovchinnikov on future of bioorganic chemistry N85-28874

NEUTRON ABSORBERS
Time-integrated yield for the Joint European Torus (JET), April - September 1984
[AERE-M-3449] N85-28797

NEUTRON ACTIVATION ANALYSIS
Time-integrated yield for the Joint European Torus (JET), April - September 1984
[AERE-M-3449] N85-28797

NEUTRON DIFFRACTION
High resolution powder diffraction
[DE85-008287] N85-28015

NEUTRON SCATTERING
Vibrational spectra of a-Fe(.78)P(.22) by inelastic neutron scattering
[DE85-008298] N85-28016
Neutron scattering and reactions on 59Co from 1 to 20 MeV
[AERE-R-11439] N85-28729
An examination of the use of wave packets for the calculation of atom diffraction by surface
[AD-A152760] N85-28735

NEUTRONS
Laser welder for fabricating neutron tubes
[DE85-009965] N85-28377

NEWS MEDIA
Origin, processing, and dissemination of scientific news, with examples from 20 research institutes
[JUEL-1940] N85-28882

NICKEL
Influence of manganese and heat treatment on structure and properties of Fe-0.1 percent-C-14 percent Cr-based steels
[BLL-BISI-TRANS-22299-(9022.06)] N85-28071

NICKEL ALLOYS
Role of hydrogen and structure on CMSX-2 N85-27967
The behaviour of nitride inclusions in nickel-base alloys
[BLL-BISI-TRANS-22396-(9022.06)] N85-28058
The effect of microalloying with calcium and magnesium on the plasticity of Poldi AKN 20 Ni-based alloy
[BLL-BISI-TRANS-2174-(9022.06)] N85-28075
Kinetics of the formation of a complex alloyed boride coating on iron and its properties
[BLL-BISI-TRANS-22303-(9022.06)] N85-28084

NICKEL HYDROGEN BATTERIES
Initial performance of advanced designs for IPV nickel-hydrogen cells
[NASA-TM-87029] N85-28444

NICKEL STEELS
The corrosion resistance of chromium-nickel steel containing rare-earth metals
[BLL-BISI-TRANS-22477-(9022.06)] N85-28041
Influence of heat treatment parameters on the properties of induction hardened Ni-Cr-Mo steels
[BLL-BISI-TRANS-2499-(9022.06)] N85-28053
Obtaining oxide films on surface of tubes of chromium-nickel steels
[BLL-BISI-TRANS-22478-(9022.06)] N85-28076
Influence of temperature in melting and casting on quality of medium-alloy steel
[BLL-BISI-TRANS-22310-(9902.06)] N85-28137
The fatigue properties of welds at low temperature, according to the type of steel
[BLL-BISI-TRANS-22455-(9022.06)] N85-28410

NIOBIUM
Submerged arc welding of new Czechoslovak micro-alloy steels
[BLL-BISI-TRANS-22193-(9022.06)] N85-28356

NIOBIUM COMPOUNDS
Thin films properties of sputtered niobium silicide on SiO2, Si3N4 and on n+ poly-Si
[AD-A152378] N85-28228

NITRATES
Influence of preliminary thermomechanical treatment on depth and hardness of nitrided layers
[BLL-BISI-TRANS-22488-(9022.06)] N85-28078

NITRIDES
The behaviour of nitride inclusions in nickel-base alloys
[BLL-BISI-TRANS-22396-(9022.06)] N85-28058
Technological apparatus for laser treatment of materials N85-28174

NITRIDING
Thermodynamic analysis of the plasma nitriding of ferrovanadium
[BLL-BISI-TRANS-22237-(9022.06)] N85-28032

NITROGEN
Systematic nomenclature of the nitrogen, oxygen and sulfur functional polycyclic aromatic hydrocarbons
[DE85-007426] N85-27974

NITROGEN OXIDES
Absolute calibrations of SO2 and NO analyzers by photographic methods
[DFVLR-MITT-85-02] N85-28504
NITROGEN PLASMA
Thermodynamic analysis of the plasma nitriding of ferrovanadium
[BLL-BISI-TRANS-22237-(9022.06)] N85-28032
NOISE MEASUREMENT
Measured noise performance of a new method of frequency hopping
[AD-A152679] N85-28234
NOISE REDUCTION
Fan noise suppression in turbofan engines
[B8580076] N85-27872
NOMENCLATURES
Systematic nomenclature of the nitrogen, oxygen and sulfur functional polycyclic aromatic hydrocarbons
[DE85-007426] N85-27974
NONDESTRUCTIVE TESTS
Structural Integrity and Durability of Reusable Space Propulsion Systems
[NASA-CP-2381] N85-27941
Differential between crack and pseudo-crack indications by means of objective magnetic flux leakage testing
[BLL-BISI-TRANS-22033-(9022.06)] N85-28386
Non-destructive testing of HF-welded pipe
[BLL-BISI-TRANS-22182-(9022.06)] N85-28388
Detecting and analyzing crack defects
[BLL-BISI-TRANS-22062-(9022.06)] N85-28723
Echo-response from crack-like two-dimensional reflectors in focused ultrasonic fields N85-28724
NONEQUILIBRIUM PLASMAS
Plasma processing of materials
[AD-A152398] N85-28800
NONFERROUS METALS
Inoculation of non-metallic inclusions in steel 17GS
[BLL-BISI-TRANS-22431-(9022.06)] N85-28042
NONLINEAR EQUATIONS
Large scale electricity production scheduling via nonlinear optimization
[REPT-84-07] N85-28655
Convergence of Newton's method for a single real equation
[NASA-TP-2489] N85-28656
On the algebraic equations in implicit Runge-Kutta methods
[CWI-NM-R8413] N85-28696
Coherent state description of non-topological solitons and momentum projection
[DE85-007814] N85-28761
NONLINEAR EVOLUTION EQUATIONS
A fast implementation of explicit time stepping algorithms with the finite element method for a class of nonlinear evolution problems
[REPT-84-03] N85-28686
NONLINEAR OPTICS
Chaos and order in an optical ring cavity
[CWI-AM-R8416] N85-28795
NONLINEAR PROGRAMMING
Large scale electricity production scheduling via nonlinear optimization
[REPT-84-07] N85-28655
NONLINEAR SYSTEMS
Numerical methods for stiff ordinary and elliptic partial differential equations
[AD-A153247] N85-28675
Scalar modal control of a nonlinear system using time varying gain
[AD-A153252] N85-28676
Estimating random integrals from noisy observations: Sampling designs and their performance
[AD-A152926] N85-28702
NONLINEARITY
Method of calculating separation flow of subsonic gas stream around wings N85-28161
Numerical solution of one-dimensional nonlinear problems of statics for elastic beams and shells under rigid constraints N85-28166
How a swing behaves
[DE85-008280] N85-28720
Nonlinear problems in continuum mechanics
[AD-A153387] N85-28846
NONPARAMETRIC STATISTICS
Confidence intervals based on interpolated order statistics
[AD-A152607] N85-28701
NOSE CONES
Structure of SYLDA double launch system for Ariane N85-28185
NOSES (FOREBODIES)
Development of a fuselage forward section in Carbon Fiber Reinforced Plastic (CFRP) type of construction
[MBB/LFA34/CFK/PUB/008] N85-27851
NOTCHES
Weldability of micro-alloy steels as reaction of structure and inclusions
[BLL-BISI-TRANS-22196-(9022.06)] N85-28027
NOZZLE DESIGN
Characteristics of a confined jet thrust vector control nozzle
[AD-A153087] N85-28268
NUCLEAR CAPTURE
Activities of the Solid State Physics Research Institute
[NASA-CR-175899] N85-28818
A 200-MeV pi(+) induced nucleon removal from 24Mg N85-28821
NUCLEAR ELECTRIC POWER GENERATION
USSR report: Engineering and equipment
[JPRS-UEQ-85-004] N85-28142
NUCLEAR FUSION
Experimental plasma research: Plasma summaries
[DE85-008116] N85-28805
Tokamak fusion core experiment maintenance study
[DE85-008040] N85-28813
NUCLEAR MAGNETIC RESONANCE
NMR manometer for measuring high pressures at liquid-helium temperatures N85-28171
NUCLEAR MODELS
Particle physics: Recent successes and future prospects
[DE85-008175] N85-28765
NUCLEAR PARTICLES
A numerical study of the mean trajectory approximation in a non-adiabatic process
[AD-A152763] N85-28737
NUCLEAR PHYSICS
Heavy ion physics at BNL, the AGS and RHIC
[DE85-005951] N85-28760
High energy gamma rays from complex particle collisions
[DE85-007871] N85-28783
NUCLEAR POWER PLANTS
Corrosion test on high-alloy steels
[BLL-BISI-TRANS-21627-(9022.06)] N85-28046
NUCLEAR REACTIONS
Activities report in nuclear physics and high energy physics
[JF40026] N85-28777
NUCLEAR RESEARCH
USSR report: Engineering and equipment
[JPRS-UEQ-85-004] N85-28142
NUCLEAR STRUCTURE
Extension of the consistent Q formalism to odd-A nuclei in the W-Pt region
[DE85-008284] N85-28770
High energy gamma rays from complex particle collisions
[DE85-007871] N85-28783
A 200-MeV pi(+) induced nucleon removal from 24Mg N85-28821
NUCLEATION
Research on the kinetics of phase changes in solids
[AD-A152387] N85-27989
Experimental and theoretical study of condensation in multicomponent vapors
[DE85-009357] N85-28021
NUCLEON-NUCLEON INTERACTIONS
Nonrelativistic theory of heavy-ion collisions
[DE85-007538] N85-28747
Nucleon-nucleon program at TRIUMF
[DE85-900430] N85-28756
NUCLEONS
A 200-MeV pi(+) induced nucleon removal from 24Mg N85-28821
NULL ZONES
Adaptive nulling at HF using a compact array of active parasitic antennas
[AD-A152582] N85-28203
NUMERICAL ANALYSIS
Numerical solution of one-dimensional nonlinear problems of statics for elastic beams and shells under rigid constraints N85-28166
Kolmogorov and scalar spectral regimes in numerical turbulence
[NASA-TM-86699] N85-28264
CALTECH-DOE program on numerical analysis, computing and fundamental studies of motion, energy and mass transfer in fluids
[DE85-008106] N85-28274
Spectral decomposition and verification of NOGAPS 500MB medium-range forecasts
[AD-A152550] N85-28520
Software for estimating sparse Hessian matrices
[DE85-008121] N85-28629
A discussion of adaptive grids and their applicability in numerical hydrodynamic modeling
[AD-A151843] N85-28659
Numerical methods for stiff ordinary and elliptic partial differential equations
[AD-A153247] N85-28675
Numerical evaluation of low frequency sound propagation in layered media
[AD-A152690] N85-28728
Fluid modeling of magnetized plasmas
[DE85-007679] N85-28804
NUMERICAL CONTROL
The application of numerical control (NC) in manufacturing wind tunnel models
[B8580078] N85-28140
Automation of Precise Time Reference Stations (PTRS) N85-28291
Adapting shape parameters for cubic Bezier curves N85-28576
Triangular Berstein-Bezier patches, a survey and new results N85-28577
A uniform subdivision method for triangular Bezier patches N85-28578
Microprocessor controlled temperature chassis
[DE85-008392] N85-28602
NUMERICAL WEATHER FORECASTING
Statistical interpretation of the ECMWF model using MOS to predict surface wind and temperature
[WSR-2] N85-28515
NYLON (TRADEMARK)
The effects of sea water and concentrated salt solutions on the fatigue of nylon 6,6 fibers N85-28416

O

OBSERVATION AIRCRAFT
Investigation of air pollution impact in Eastern Bavaria: Measurement results from August and September, 1984
[DFVLR-FB-85-03] N85-28471
OCEAN BOTTOM
The effect of the Benthic Boundary Layer on the physics of intense mesoscale eddies
[AD-A153193] N85-28270
OCEAN CURRENTS
Towards a study of synoptic-scale variability of the California current system
[NASA-CR-175871] N85-28529
OCEANOGRAPHIC PARAMETERS
Towards a study of synoptic-scale variability of the California current system
[NASA-CR-175871] N85-28529
OCEANOGRAPHY
The effect of the Benthic Boundary Layer on the physics of intense mesoscale eddies
[AD-A153193] N85-28270
ODD-EVEN NUCLEI
Extension of the consistent Q formalism to odd-A nuclei in the W-Pt region
[DE85-008284] N85-28770
OILS
Combustion and micro-explosion of water/oil emulsions in high pressure environments
[AD-A152960] N85-27997
ON-LINE SYSTEMS
A study of user-defined searching requirements for the on-line version of the directory of DOD-sponsored R and D data bases on the Defense Gateway computer system
[AD-A153000] N85-28878
OPENINGS
Strength and failure analysis of composite laminates with holes at room and elevated temperatures
[AD-A153263] N85-27981
OPERATING SYSTEMS (COMPUTERS)
Multicomputer operating systems and applications
[AD-A153205] N85-28648
The design of a capability-based distributed operating system
[CWI-CS-R8418] N85-28650
Distributed systems management in wide area networks
[CWI-CS-R8419] N85-28651
OPERATING TEMPERATURE
Stressed-strained state of tightening buckles in sectional runners of gas turbines N85-28149
OPERATIONS RESEARCH
A greedy algorithm for the transhipment along a single road problem
[AD-A152343] N85-28709
Future directions in operations research
[REPT-84-24] N85-28711
Operations research
[B8581897] N85-28712
OPERATORS (MATHEMATICS)
Deconvolution methods for multi-sensors
[AD-A152351] N85-28680
A note on integral operators
[REPT-83-26] N85-28688

OPERATORS (PERSONNEL)
A comparison of numeric data entry with touch-sensitive and conventional numeric keypads
[AD-A153276] N85-28598
OPIK THEORY
The study of the physics of cometary nuclei
[NASA-CR-175917] N85-28905
OPTICAL COMMUNICATION
The weighting function for scintillation on a folded path
[AD-A152659] N85-28206
OPTICAL CORRECTION PROCEDURE
Holographic corrector in objective with compound main mirror N85-28153
OPTICAL COUPLING
Spatial light modulator having a capacitively coupled photoconductor
[AD-D011646] N85-28790
OPTICAL DATA PROCESSING
Optical phenomena in computer vision
[AD-A152970] N85-28595
Studies of optical-beam phase-conjugation by nonlinear refraction
[AD-A152665] N85-28788
Spatial light modulator having a capacitively coupled photoconductor
[AD-D011646] N85-28790
OPTICAL EQUIPMENT
Acoustooptic pulse-echo transducer system
[NASA-CR-175919] N85-28224
Instabilities and chaotic behavior of active and passive laser systems
[AD-A153366] N85-28346
Support structures for optical components in the Laser Demonstration Facility
[DE85-008879] N85-28349
Spatial light modulator having a capacitively coupled photoconductor
[AD-D011646] N85-28790
OPTICAL MEASUREMENT
Recent advances in optical measurement methods in physics and chemistry
[DE85-008695] N85-28792
OPTICAL MEASURING INSTRUMENTS
Optical strain measurement system development N85-27969
Optical system for measuring shadowgraph data
[AD-D011642] N85-28784
OPTICAL PROPERTIES
USSR report: Engineering and equipment
[JPRS-UEQ-85-004] N85-28142
Materials-process interactions in ternary alloy semiconductors
[AD-A153133] N85-28832
OPTICAL PUMPING
High precision materials characterization in the near millimeter wave-length range
[AD-A153267] N85-28331
Design and construction of a CW ND:YAG laser using a single elliptical cavity and water cooled krypton arc lamp pumping
[AD-A152657] N85-28340
Experimental study of dissociative attachment in optically-pumped lithium molecules
[AD-A152800] N85-28738
OPTICAL RADAR
Convective storm downdraft outflows detected by NASA/MSFC's Airborne 10.6 micron pulsed Doppler Lidar System
[NASA-CR-3898] N85-28511
OPTICAL RESONATORS
Resonator optical designs for free electron lasers
[DE85-007678] N85-28347
OPTICAL TRACKING
M-BLASER: A device to study pursuit tracking in the rhesus monkey
[AD-A152986] N85-28534
Pursuit tracking performance and flash disruption: The effects of training the non-dominant eye on target reacquisition
[AD-A153404] N85-28541
OPTICAL WAVEGUIDES
Investigation of semiconductor clad optical waveguides
[NASA-CR-175870] N85-28785
Optical waveguide characterization using grating couplers
[AD-A153063] N85-28789
OPTIMIZATION
Incorporating control into the optimal structural design of large flexible space structures
[AD-A152658] N85-27937
Digital methods of the optimum processing of radar signals
[AD-A152469] N85-28202
Optimally robust redundancy relations for failure in uncertain systems
[NASA-CR-175953] N85-28391
The construction of curves and surfaces using numerical optimization techniques N85-28565
Large scale electricity production scheduling via nonlinear optimization
[REPT-84-07] N85-28655
The role of duality in optimization problems involving entropy functionals, with applications to information theory
[AD-A152336] N85-28713
Optimum dimensions of power solenoids for magnetic suspension
[NASA-TM-77864] N85-28716
ORBIT PERTURBATION
Analytical generation of satellite orbits at the RAE (Royal Aircraft Establishment)
[AD-A152655] N85-28901
ORBITAL MANEUVERS
Shuttle-tethered satellite system definition study extension
[NASA-CR-171473] N85-27923
ORBITAL MECHANICS
Shuttle-tethered satellite system definition study extension
[NASA-CR-171473] N85-27923
Maximizing the semi-major axis for a freely coning solar sailcraft
[AD-A153175] N85-27938
How a swing behaves
[DE85-008280] N85-28720
ORBITAL SPACE STATIONS
European utilization aspects of a US manned space station, volume 1
[ESA-CR(P)-1987-VOL-1] N85-27926
European utilization aspects of a US manned space station, volume 2
[ESA-CR(P)-1987-VOL-2] N85-27927
ORBITS
Multiple time-scale methods in particle simulations of plasmas
[DE85-007519] N85-28808
ORDER-DISORDER TRANSFORMATIONS
The disordering process in an L12 ordered alloy
[DE85-008152] N85-28093
ORDNANCE
Voltammetric analysis of ordnance materials. Part 2: A portable digital voltammeter for use with a silver wire working electrode
[AD-A152480] N85-28325
ORGANIC CHEMISTRY
Systematic nomenclature of the nitrogen, oxygen and sulfur functional polycyclic aromatic hydrocarbons
[DE85-007426] N85-27974
Academician Ovchinnikov on future of bioorganic chemistry N85-28874
ORGANIC PHOSPHORUS COMPOUNDS
Measurement of Franck-Condon factors for the v'=0 progression in the B-X system of PO
[AD-A152734] N85-27993
ORGANIC SILICON COMPOUNDS
Preparation of silicon carbide-silicon nitride fibers by the pyrolysis of polycarbosilazane precursors
[NASA-TM-86505] N85-28107
ORGANIZATIONS
An examination of alternative forms of fit in contingency theory
[AD-A152602] N85-28853
The concept of fit in contingency theory
[AD-A152603] N85-28854
ORGANOMETALLIC COMPOUNDS
The spectroscopy and reaction kinetics of coordinated unsaturated metal carbonyls
[AD-A153079] N85-28003
OROGRAPHY
Statistical comparison of radar echoes of convective precipitation between the northern Alps and its forsland
[DFVLR-FB-85-07] N85-28215
On Long's solution to hydrostatic flow over mountains
[DFVLR-MITT-84-02] N85-28503
ORTHOGONAL FUNCTIONS
Natural vibrations of reinforced spherical shells N85-28165
Symbolic Givens reduction in large sparse least squares problems
[DE85-008685] N85-28681
ORTHOTROPIC PLATES
Biaxial buckling of specially orthotropic, symmetric composite rectangular plates
[AD-A152958] N85-28417
OSCILLATIONS
Wing tunnel investigation of dynamic stall of an NACA 0018 airfoil oscillating in pitch
[NAE-AN-27] N85-27830
Buildup of oscillation of bodies in stratified fluid N85-28157
Acoustic oscillations of rods and plates N85-28170
Effects of level broadening on the magnetothermal oscillations in two-dimensional electron systems
[AD-A152639] N85-28732
OSCILLATORS
The measurement of linear frequency drift in oscillators N85-28316
The superconducting cavity stability ruby maser oscillator N85-28324
VULTURE manual
[DE85-008873] N85-28631
How a swing behaves
[DE85-008280] N85-28720
OUTLIERS (STATISTICS)
A multiple regression technique for detecting outliers
[REPT-84-33] N85-28706
OXIDATION
Elementary reactions of importance in oxidation, combustion ignition and flame inhibitions
[AD-A153139] N85-28004
Oxygen isotopic study of the oxidation of SO2 by H2O2 in the atmosphere
[DE85-004017] N85-28468
OXIDATION-REDUCTION REACTIONS
The electronic spectra of phthalocyanine radical anions and cations
[AD-A152328] N85-27986
OXIDE FILMS
Obtaining oxide films on surface of tubes of chromium-nickel steels
[BLL-BISI-TRANS-22478-(9022.06)] N85-28076
Technology development for thin-film-trace humidity sensors
[BMFT-FB-T-84-268] N85-28338
OXIDES
Quality testing to the specifications of the Stahl-Eisen-Pruefblatt 1570/71 using an automatic image analysis system
[BLL-BISI-TRANS-22253-(9022.06)] N85-28385
OXYGEN
Systematic nomenclature of the nitrogen, oxygen and sulfur functional polycyclic aromatic hydrocarbons
[DE85-007426] N85-27974
Oxygen evolution on NiCo2O4 electrodes N85-28026
Thermodynamic calculations of equilibrium states in metal-carbon-hydrogen-oxygen system
[BLL-BISI-TRANS-22092-(9022.06)] N85-28844
OXYGEN COMPOUNDS
Gas phase ion-molecule chemistry of carbon, nitrogen and oxygen compounds
[AD-A152876] N85-27996
OXYGENATION
Jet fuel instability mechanisms
[NASA-CR-175856] N85-28127

P

PACKAGING
Encapsulation and packaging of a semiconductor multielectrode array for cortical implantation
[AD-A153180] N85-28535
PACKET TRANSMISSION
Wideband integrated voice/data technology
[AD-A152329] N85-28197
PAINTS
Forming of coating protection system: Mechanism of paint-coating anti-corrosion protection of steel
[BLL-BISI-TRANS-22081-(9022.06)] N85-28033
PAIR PRODUCTION
Photon-photon collisions
[DE85-008056] N85-28742
Physics of (very) high energy e(+)-e(-) colliders
[DE85-008177] N85-28780
PANELS
The touch panel system: Design and development
[AD-A153014] N85-28596
PARABOLAS
Curved finite elements and curve approximation N85-28590
PARABOLIC DIFFERENTIAL EQUATIONS
Analysis of nonlinear parabolic equations modeling plasma diffusion across a magnetic field
[DE85-007683] N85-28807
PARABOLIC REFLECTORS
Activity and accomplishments of dish/Stirling electric power system development
[NASA-CR-175841] N85-28445
Parabolic dish test site: History and operating experience
[NASA-CR-175892] N85-28447
A program for the calculation of paraboloidal-dish solar thermal power plant performance
[NASA-CR-175874] N85-28449

Shenandoah parabolic dish solar collector
[DE85-008326] N85-28460
DOE/Sandia point-focus concentrator program, draft
[DE85-008209] N85-28793

PARABOLOID MIRRORS
Holographic corrector in objective with compound main mirror N85-28153

PARALLEL PROCESSING (COMPUTERS)
Language design, computers and brains
[AD-A152819] N85-28594
Introduction to the IEEE-488 bus
[INPE-3316-NTE/227] N85-28613
Efficient parallel solution of linear systems with hyperbolic rotations
[AD-A152355] N85-28661
Efficient parallel solution of linear systems
[AD-A152663] N85-28663
Torus data flow for parallel computation of missized matrix problems
[DE85-008761] N85-28715

PARALLEL PROGRAMMING
Research in computer science
[NASA-CR-175922] N85-28612

PARAMETER IDENTIFICATION
Parameter identification results of tests in nonsteady symmetric flight with the Hawker Hunter Mk 7
[NLR-TR-83042-U] N85-27860
Identification of gust input and gust response characteristics from Do 28 TNT flight test data
[DFVLR-FB-84-48] N85-27881
Heating parameter estimation using coaxial thermocouple gages in wind tunnel test articles
[AD-A153039] N85-28328
Robust regression through robust covariances
[AD-A153301] N85-28677

PARAMETERIZATION
Parameterization of subgrid-scale fluxes in mesoscale meteorological models
[AD-A153016] N85-28523
Free-form design in solid modelling N85-28569
Adapting shape parameters for cubic Bezier curves N85-28576
Parameterization in grid generation N85-28581

PARAMETRIC FREQUENCY CONVERTERS
Principles of designing digital compensating accelerometers N85-28172

PARTIAL DIFFERENTIAL EQUATIONS
Natural vibrations of reinforced spherical shells N85-28165
Parameterization in grid generation N85-28581
A survey of composite grid generation for general three-dimensional sections N85-28584

PARTICLE ACCELERATION
IMS (International Magnetospheric Study) contributions to the understanding of auroral precipitation, transport, and particle sources
[AD-A152320] N85-28492

PARTICLE ACCELERATOR TARGETS
Laser measurements of distances from the ORELA neutron target to experiment stations along flight paths 1 and 6
[DE85-009457] N85-28352

PARTICLE ACCELERATORS
Experiments and detectors for high energy heavy ion colliders
[DE85-007927] N85-28748
Report of the Working Group on Other Acceleration Schemes
[DE85-008447] N85-28764
Activities report in nuclear physics and high energy physics
[JF40026] N85-28777

PARTICLE BEAMS
A proportional-plus-integral controller for a particle beam weapon
[AD-A153213] N85-28778

PARTICLE COLLISIONS
Measuring structure functions at SSC energies
[DE85-007515] N85-28746
Cluster production and entropy
[DE85-007626] N85-28752
New experimental results in two photon physics
[NIKHEF-H/84-16] N85-28776
Physics of (very) high energy e(+)-e(-) colliders
[DE85-008177] N85-28780
High energy gamma rays from complex particle collisions
[DE85-007871] N85-28783

PARTICLE EMISSION
Theoretical studies of high energy phenomenon: Analysis of models of CP and T violation
[DE85-007455] N85-28782

PARTICLE ENERGY
Particle physics: Recent successes and future prospects
[DE85-008175] N85-28765

PARTICLE INTERACTIONS
Introduction to LINE: A Feynman diagram graphic operator
[DE85-009299] N85-28632
Implications for supersymmetry of the CERN monojets
[DE85-008178] N85-28741
Photon-photon collisions
[DE85-008056] N85-28742
Measuring structure functions at SSC energies
[DE85-007515] N85-28746
Electroweak interactions in nuclei
[DE85-007811] N85-28762
Possible indication of an A-dependence of R in deep-inelastic electron scattering from nuclei
[DE85-008174] N85-28763
Physics of (very) high energy e(+)-e(-) colliders
[DE85-008177] N85-28780

PARTICLE MOTION
CALTECH-DOE program on numerical analysis, computing and fundamental studies of motion, energy and mass transfer in fluids
[DE85-008106] N85-28274
Stability in dynamical systems
[DE85-006698] N85-28766

PARTICLE PRECIPITATION
IMS (International Magnetospheric Study) contributions to the understanding of auroral precipitation, transport, and particle sources
[AD-A152320] N85-28492

PARTICLE PRODUCTION
Preparation of polystryene latex particles in a rotating reactor
[NASA-CR-171475] N85-28108
Implications for supersymmetry of the CERN monojets
[DE85-008178] N85-28741
Photon-photon collisions
[DE85-008056] N85-28742
Experiments with light ions at CERN super proton synchrotron
[DE85-007625] N85-28744
Cluster production and entropy
[DE85-007626] N85-28752
Heavy quark production processes in QCD
[DE85-007240] N85-28779
Experimental methods of heavy quark detection
[DE85-006316] N85-28781

PARTICLE SIZE DISTRIBUTION
An investigation into the soot production processes in a gas turbine engine
[AD-A152710] N85-27992

PARTICLE SPIN
Muon spin rotation studies N85-28819

PARTICLE TRAJECTORIES
A numerical study of the mean trajectory approximation in a non-adiabatic process
[AD-A152763] N85-28737

PARTICLES
Preparation of polystryene latex particles in a rotating reactor
[NASA-CR-171475] N85-28108

PARTICULATE SAMPLING
Microcomputer-controlled system for measuring atmospheric particle fluxes
[DE85-007910] N85-28469

PASSIVITY
Corrosion characteristics of some steels produced through a self-cleaning rotating electrode
[BLL-BISI-TRANS-22046-(9022.06)] N85-28034

PATENTS
Jinc-trap resonator
[AD-D011650] N85-28339

PDP 11 COMPUTER
Data processing on the rotor test stand at DFVLR in Brunswick: Microprogrammable interfaces and array processor as key components in a PDP 11 real time data acquisition and processing system
[DFVLR-MITT-85-03] N85-27921

PEARLITE
Influence of preliminary cold deformation on fineness of pearlite
[BLL-BISI-TRANS-22409-(9022.06)] N85-28054

PERFORMANCE PREDICTION
Calculation of viscous compressible flows in small gas turbines N85-27950
Flat magnetohydrodynamic induction pump N85-28145
A program for the calculation of paraboloidal-dish solar thermal power plant performance
[NASA-CR-175874] N85-28449

PERFORMANCE TESTS
Distance Measuring Equipment (DME), general
[AD-A152585] N85-27846
An assessment of the suitability of the BHGA structural test rig for aerodynamic testing of hang gliders
[CA-8505] N85-27853
Rotorcraft research testing in the National Full-Scale Aerodynamics Complex at NASA Ames Research Center
[NASA-TM-86687] N85-27854
Testing of materials and coatings for jet engine components under simulated operational conditions
[B8580073] N85-27873
Evaluation of used crankcase oils using computerized infrared spectrometry. Appendices
[AD-A152994] N85-28000
MM2 LRSLA testing stage 3 propellant
[AD-A152540] N85-28128
Performance evaluation of fiber-optic converters N85-28154
Performance analysis of the DSN baseband assembly (Bba) Real-Time Combiner (RTC)
[NASA-CR-175878] N85-28190
Baseline cycle testing of a 500-kWh zinc chloride battery at the Battery Energy Storage Test (BEST) Facility
[DE85-006948] N85-28249
Test and evaluation of the Hoppecke Model E240G144/16 electric vehicle battery charger
[DE85-900573] N85-28253
International time transfer and portable clock evaluation using GPS timing receivers: Preliminary results N85-28303
Field test report of the Department of Energy's 100-kW vertical axis wind turbine
[DE85-008475] N85-28458
Shenandoah parabolic dish solar collector
[DE85-008326] N85-28460
Test plan for acceptance, verification and performance testing of the Bedford Lucas Chloride Electric Van. Part 1: Acceptance and verification testing at EG and G Automotive Research. Part 2: INEL performance testing, revision 1
[DE85-005157] N85-28888

PERIODIC FUNCTIONS
On the accuracy of the Poincare-Lindstedt method
[REPT-84-37] N85-28690
Symmetric linear multistep methods for second-order differential equations with periodic solutions
[CWI-NM-R8501] N85-28698

PERIPHERAL EQUIPMENT (COMPUTERS)
Generation and display apparatus
[AD-D011639] N85-28599

PERIPHERAL VISION
Perception of roll rate from an artificial horizon and peripheral displays
[VTH-LR-403] N85-28557

PERSONALITY
Individual characteristics and unit performance: A review of research and methods
[AD-A153145] N85-28550

PERSONNEL
Predictors of transfer adjustment: A longitudinal study
[AD-A152462] N85-28548
An empirical comparison of the accuracy of univariate and multivariate corrections for range restriction
[AD-A153071] N85-28670

PERSONNEL DEVELOPMENT
Guidelines of the Federal Minister of Transportation for the formation and examination of airline personnel, part 4 N85-28556

PERSONNEL SELECTION
Construction of a job-oriented test for the selection of air traffic controllers
[DFVLR-FB-84-51] N85-28558

PERTURBATION
Analysis of control system from a viewpoint of desired pole placement and desired degree of robustness
[AD-A152627] N85-27876
Maximizing the semi-major axis for a freely coning solar sailcraft
[AD-A153175] N85-27938
Experiments on sorption characteristics of solid desiccant materials for solar desiccant cooling systems
[DE85-000542] N85-28019
Supersonic flow around blunt wedge N85-28158

PERTURBATION THEORY
The temperature dependence of diffracted beam intensities in atom-surface scattering
[AD-A152762] N85-28736
Photon structure function: Theory
[DE85-008064] N85-28745
Stability in dynamical systems
[DE85-006698] N85-28766
Theoretical and numerical studies of magnetic field line displacements in an Elmo Bumpy Torus
[DE85-008757] N85-28816

PETROGRAPHY
Structural analysis of terrane accretions in the eastern Brooks Range and adjacent areas in central Alaska and Canada
[DE85-006279] N85-28501

PHASE CHANGE MATERIALS
Effects of the phase compositions of cast low-pearlite steels micro-alloyed with vanadium and titanium of their structure and properties
[BLL-BISI-TRANS-22301-(9022.06)] N85-28067
High temperature composite thermal storage systems
[DE85-005073] N85-28455
PHASE DIAGRAMS
Activities report of the Institute of Astronomy and Astrophysics N85-28892
PHASE ERROR
Angular tracking error in A phase comparison monopulse tracking radar: A critical review and extension of the phase front distortion approach
[AD-A152628] N85-28205
PHASE LOCKED SYSTEMS
Experimental performance of a frequency measurement circuit
[AD-A152951] N85-28239
PHASE TRANSFORMATIONS
Research on the kinetics of phase changes in solids
[AD-A152387] N85-27989
Study of self-propagating condensed phase reactions TiB(2) synthesis
[AD-A153196] N85-28006
Microstructure-mechanical property relationships in transformation-toughened ceramics
[DE85-009722] N85-28117
PHONONS
Theory of laser-stimulated surface process. 2: A generalized-master-equation approach to energy transfer between an IR laser, an aspecties and phonons
[AD-A153063] N85-28344
PHOSPHAZENE
The synthesis and structure of polyphosphazenes
[AD-A153134] N85-28112
PHOSPHORS
Streak tube characterization
[DE85-009874] N85-28255
PHOTOCATHODES
Streak tube characterization
[DE85-009874] N85-28255
PHOTOCHEMICAL REACTIONS
The enhancement of molecular fluorescence and photochemistry by small metal particles
[AD-A152740] N85-27994
Photochemical ignition studies. 1: Laser ignition of flowing premixed gases
[AD-A153048] N85-28002
Photochemistry of coordination complexes: The phthalocyanines
[DE85-007693] N85-28022
PHOTOCONDUCTIVITY
Properties of defects in Hg(1-x)Cd(x)Te
[AD-A153243] N85-28835
PHOTODIODES
Self-scanning MDS-integrated photosensor strip N85-28151
PHOTODISSOCIATION
Crossed molecular beam studies of the reactions of oxygen and fluorine atoms
[AD-A153302] N85-28008
PHOTOELECTRIC CELLS
Performance evaluation of fiber-optic converters N85-28154
PHOTOELECTROCHEMISTRY
The electrochemistry of azine, oxazine and thiazine dyes
[AD-A152394] N85-27990
PHOTOELECTRON SPECTROSCOPY
Spectroscopy of surface adsorbed molecules
[DE85-009452] N85-28768
Materials-process interactions in ternary alloy semiconductors
[AD-A153133] N85-28832
PHOTOGRAPHY
USSR report: Engineering and equipment
[JPRS-UEQ-85-004] N85-28142
PHOTOINTERPRETATION
Documentation of PHOTO: A user's manual for the analysis of photographic and X-ray negatives
[AD-A152988] N85-28327
Airphoto interpretation of vegetation and landforms for soil mapping N85-28436
PHOTOIONIZATION
Photoionization mass spectrometry with VUV hydrogen laser source
[AD-A153362] N85-28009
An ultrasensitive and element specific photoionization detection system for environmental analysis
[AD-A153365] N85-28332
Experimental study of dissociative attachment in optically-pumped lithium molecules
[AD-A152800] N85-28738
PHOTOLYSIS
Photochemical ignition studies. 1: Laser ignition of flowing premixed gases
[AD-A153048] N85-28002
The spectroscopy and reaction kinetics of coordinated unsaturated metal carbonyls
[AD-A153079] N85-28003
Kinetics of hydrolysis and products of hydrolysis and photolysis of tetryl
[AD-A153144] N85-28005
Study of the formation of sulfuric acid aerosols
[DE85-008102] N85-28011
PHOTOMETRY
Absolute calibrations of SO2 and NO analyzers by photographic methods
[DFVLR-MITT-85-02] N85-28504
PHOTONS
Photon-photon collisions
[DE85-008056] N85-28742
Photon structure function: Theory
[DE85-008064] N85-28745
Incorporation of Monte Carlo electron interface studies into photon general cavity theory
[DE85-007674] N85-28772
New experimental results in two photon physics
[NIKHEF-H/84-16] N85-28776
PHOTOPLASTICITY
State of stress and penetration of plastic deformation in forming
[BLL-BISI-22199-(9022.06)] N85-28396
PHOTOSENSITIVITY
The electrochemistry of azine, oxazine and thiazine dyes
[AD-A152394] N85-27990
PHOTOSYNTHESIS
Photosynthetic acclimation of Acer saccharum
[DE85-008247] N85-28536
PHOTOTHERMAL CONVERSION
High-altitude testing of selective optical coatings for solar radiators and collectors N85-28143
Selective coatings for solar heat converters N85-28144
PHOTOTRANSISTORS
The touch panel system: Design and development
[AD-A153014] N85-28596
PHOTOVOLTAIC CELLS
Electrical research on solar cells and photovoltaic materials
[NASA-CR-175897] N85-28452
Terrestrial photovoltaic power systems with sunlight concentration
[DE85-006398] N85-28464
PHOTOVOLTAIC CONVERSION
Documents of the JPL Photovoltaics Program Analysis and Integration Center: An annotated bibliography
[NASA-CR-175873] N85-28448
Development of a second-generation linear Fresnel Photovoltaic and Thermal (PVT) concentrator array, including fabrication and installation of a 200 square meter collector field
[DE85-008473] N85-28465
PHOTOVOLTAIC EFFECT
Relative potentials of concentrating and two-axis tracking flat-plate photovoltaic arrays for central-station applications
[NASA-CR-175889] N85-28446
PHTHALOCYANIN
The production of copper phthalocyanine and/or its derivatives
[NASA-TM-77629] N85-27983
The electronic spectra of phthalocyanine radical anions and cations
[AD-A152328] N85-27986
Photochemistry of coordination complexes: The phthalocyanines
[DE85-007693] N85-28022
PHYSIOCHEMISTRY
Physio-chemical mechanisms of the processes of the formation of globular inclusions in ball-bearing metal
[BLL-BISI-TRANS-22235-(9022.06)] N85-28030
Physical-chemical model for the mechanism of glass corrosion with particular consideration of simulated radioactive waste glasses
[DE85-007713] N85-28121
PHYSIOLOGICAL EFFECTS
Biological and human health effects of extremely low frequency electromagnetic fields. Post-1977 literature review
[AD-A152731] N85-28539
Mechanizing of handling operations in drop forging with hammers and presses (conducted ergonomical examinations)
[BMFT-FB-HA-84-051] N85-28561
PIEZOELECTRIC CERAMICS
Scattering of sounds by piezoceramic cylindrical shell near rigid surface N85-28168
PIEZOELECTRIC TRANSDUCERS
A study of gas solid reactions using coated piezoelectric detectors
[AD-A153047] N85-28001
PILOT PERFORMANCE
Development factors and field dependence-independence
[AD-A152337] N85-28545
Technical evaluation of the Naval Automated Pilot Aptitude Measurement System (NAPAMS)
[AD-A152361] N85-28547
Stabilizing force feedback in bio-actuated control systems
[AD-D011634] N85-28560
PILOT TRAINING
Technical evaluation of the Naval Automated Pilot Aptitude Measurement System (NAPAMS)
[AD-A152361] N85-28547
Guidelines of the Federal Minister of Transportation for the formation and examination of airline personnel, part 4 N85-28556
PILOTS (PERSONNEL)
Aspects of application of ACT systems for pilot workload alleviation N85-27887
Development factors and field dependence-independence
[AD-A152337] N85-28545
PINS
Printed wiring board circuit isolator tool
[AD-D011638] N85-28333
PIPE FLOW
Heat transfer in pipes
[NASA-TM-77838] N85-28262
Steady, incompressible, inviscid flow through a finite collapsible tube under longitudinal tension
[REPT-84-01] N85-28278
Flow through finite collapsible tubes: A branching problem
[REPT-84-29] N85-28281
PIPELINES
Effect of the agressive action of soil on metallic pipelines. New possibilities for the passive and active corrosion protection
[BLL-BISI-TRANS-21630-(9022.06)] N85-28070
Hydrogen degradation of pipeline steels
[DE85-008930] N85-28101
PIPELINING (COMPUTERS)
Pipelined programmable charge domain device
[AD-D011598] N85-28225
PIPES (TUBES)
Local heat treatment of welded joints of pipes and rotary vessels N85-28028
Obtaining oxide films on surface of tubes of chromium-nickel steels
[BLL-BISI-TRANS-22478-(9022.06)] N85-28076
Removal of longitudinal internal flash from electrically welded tubes
[BLL-BISI-TRANS-22380-(9022.06)] N85-28136
Local heat treatment of welded joints of pipes and rotary vessels
[BLL-BISI-TRANS-22197-(9022.06)] N85-28354
Application of 4-wire submerged arc method to welding UOE pipe
[BLL-BISI-TRANS-22417-(9022.06)] N85-28358
Production of thin-walled electricity welded tubes with reduced internal flash
[BLL-BISI-TRANS-22381-(9022.06)] N85-28364
High-speed longitudinal welding of pipes by automatic submerged arc process
[BLL-BISI-TRANS-22340-(9902.06)] N85-28366
Production of electrically welded tubes with removed internal flash
[BLL-BISI-TRANS-22382-(9022.06)] N85-28367
Steel Tubes
[BLL-BISI-TRANS-22064-(9022.06)] N85-28369
Statistical models used in analyzing the quality of welded tubes
[BLL-BISI-TRANS-22232-(9022.06)] N85-28384
Non-destructive testing of HF-welded pipe
[BLL-BISI-TRANS-22182-(9022.06)] N85-28388
Principal quality assurance measures in the manufacture of HF-welded high-pressure linepipe
[BLL-BISI-TRANS-21690-(9022.06)] N85-28389
DOE/ANL/HTRI heat exchanger tube vibration data bank: Addendum 5
[DE85-007730] N85-28425
PITCH (INCLINATION)
Wing tunnel investigation of dynamic stall of an NACA 0018 airfoil oscillating in pitch
[NAE-AN-27] N85-27830
Proposals for the determination of necessary elevator handling characteristics of sailplanes in high speed range
[DFVLR-FB-84-52] N85-27882

PLANE WAVES
Kirchhoff modeling via wave equation datuming
[AD-A152399] N85-28727
PLANETARY ATMOSPHERES
An experimental investigation of the angular scattering and backscattering behaviors of the simulated clouds of the outer planets
[NASA-CR-175909] N85-28896
PLANNING
Historical perspective on the Moon base: The British perspective
[DE85-005905] N85-27925
PLANTS (BOTANY)
Photosynthetic acclimation of Acer saccharum
[DE85-008247] N85-28536
PLASMA ACCELERATION
Transverse electron resonance accelerator
[DE85-006289] N85-28758
Report of the Working Group on Other Acceleration Schemes
[DE85-008447] N85-28764
PLASMA CONTROL
Stability of high energy particle plasmas to MHD-like modes
[DE85-007879] N85-28803
An Impurity Control Test Facility (ICTF) for the study of fusion reactor/plasma edge materials
[DE85-007946] N85-28810
PLASMA DIAGNOSTICS
Sub-nanosecond cinematography in laser fusion research: Current techniques and applications at the Lawrence Livermore Laboratory
[DE85-007252] N85-28334
Experimental plasma research: Plasma summaries
[DE85-006116] N85-28805
Accelerator-based plasma-wall interaction studies on the TEXTOR Tokamak
[DE85-007540] N85-28806
PLASMA DIFFUSION
Stefan-Maxwell relations for plasma diffusion currents in magnetic field N85-28160
PLASMA FOCUS
Restrike particle beam experiments on a dense plasma focus. Opening switch research on a dense plasma focus
[AD-A152991] N85-28802
PLASMA INTERACTIONS
Examination of a method for predicting the properties of railgun plasmas
[AR-004-322] N85-28799
Microwave experimental studies of laser fusion
[DE85-006327] N85-28814
PLASMA JETS
Thermodynamic analysis of the plasma nitriding of ferrovanadium
[BLL-BISI-TRANS-22237-(9022.06)] N85-28032
Implications for supersymmetry of the CERN monojets
[DE85-008178] N85-28741
Examination of a method for predicting the properties of railgun plasmas
[AR-004-322] N85-28799
PLASMA LAYERS
The transport of neutral H, D, T and He and O in the boundary layers of a Tokamak plasma
[REPT-84-153] N85-28817
PLASMA OSCILLATIONS
Stefan-Maxwell relations for plasma diffusion currents in magnetic field N85-28160
PLASMA PHYSICS
Plasma processing of materials
[AD-A152398] N85-28800
Experimental plasma research: Plasma summaries
[DE85-006116] N85-28805
PLASMA RADIATION
An Impurity Control Test Facility (ICTF) for the study of fusion reactor/plasma edge materials
[DE85-007946] N85-28810
PLASMA SHEATHS
Ionospheric effects on antenna impedance
[BMFT-FB-W-84-052] N85-28217
PLASMA TEMPERATURE
Study of a constricted electric arc cooled by transpiration
[NASA-TM-77846] N85-28798
A numerical solution technique for multitemperature plasma hydrodynamics
[AD-A152701] N85-28801
PLASMAS (PHYSICS)
The decomposition of gas phase formaldehyde by plasma discharge
[AD-A153202] N85-28007
Geophysical plasmas and atmospheric modeling
[AD-A152805] N85-28497
Time-integrated yield for the Joint European Torus (JET), April - September 1984
[AERE-M-3449] N85-28797
Plasma processing of materials
[AD-A152398] N85-28800
A numerical solution technique for multitemperature plasma hydrodynamics
[AD-A152701] N85-28801
Multiple time-scale methods in particle simulations of plasmas
[DE85-007519] N85-28808
PLASTIC DEFORMATION
Thermomechanical softening treatment for bearing and tool steels
[BLL-BISI-TRANS-22432-(9022.06)] N85-28035
Influence of eutectic silicate inclusions on micro-processes during deformation and fracture of 12GS steel
[BLL-BISI-TRANS-22296-(9022.06)] N85-28073
New method for determining stampability of sheet materials
[BLL-BISI-22486-(9022.06)] N85-28360
State of stress and penetration of plastic deformation in forming
[BLL-BISI-22199-(9022.06)] N85-28396
Effects of the structural state in thermo-bimetals on their resistance to microscopic plastic deformation
[BLL-BISI-TRANS-22403-(9022.06)] N85-28412
Critical conditions for failure in materials subjected to high rates of loading
[AD-A153135] N85-28420
PLASTIC FLOW
Conformational and mechanical properties at high strain rates
[AD-A153401] N85-28272
PLASTIC PROPERTIES
Properties of corrosion resistant stabilized ferritic steels
[BLL-BISI-TRANS-22519-(9022.06)] N85-28039
The effect of microalloying with calcium and magnesium on the plasticity of Poldi AKN 20 Ni-based alloy
[BLL-BISI-TRANS-2174-(9022.06)] N85-28075
The Shock and Vibration Digest, volume 17, no. 2
[AD-A153129] N85-28400
Recent progress in the dynamic plastic behaviour of structures, part 4 N85-28402
Cyclic torsion of a circular cylinder and its residual stress distribution
[AD-A153347] N85-28424
PLASTICS
Natural and accelerated aging of plastics N85-28123
Qualitative and quantitative determination of aging by mechanical tests — plastics N85-28393
PLATES (STRUCTURAL MEMBERS)
Solution to eigenvalue problems of antisymmetric cross-ply and antisymmetric angle-ply laminated plates using affine transformations
[AD-A153040] N85-27980
Acoustic oscillations of rods and plates N85-28170
PLATINUM
Methanol adsorption on Pt(111)
[DE85-006802] N85-28017
PLOTTING
Looking at more than three dimensions
[DE85-007784] N85-28600
POINTS
On the exceedance point process for a stationary sequence
[AD-A152827] N85-28665
POISSON DENSITY FUNCTIONS
On the exceedance point process for a stationary sequence
[AD-A152827] N85-28665
POISSON RATIO
Limiting values of stress state index after rupture of metals
[BLL-BISI-TRANS-22293-(9022.06)] N85-28407
POLAR REGIONS
Electron and ion distributions at high latitudes as measured by the Air Force polar orbiting satellites
[AD-A153242] N85-28500
POLARITY
Luminescence probe studies of ionomers. I: Steady-state measurements from nafion membrane
[AD-A152475] N85-28730
POLARIZATION (WAVES)
Incident beam polarization for laser Doppler velocimetry employing a sapphire cylindrical window
[NASA-TM-87084] N85-28786
POLICIES
West Europe report: Science and technology
[JPRS-WST-84-024] N85-28183
Social and political problems in Soviet basic research
[AD-P004565] N85-28860
POLITICS
Social and political problems in Soviet basic research
[AD-P004565] N85-28860
Technology and Soviet political choices
[AD-P004566] N85-28861
POLLUTION MONITORING
A study of gas solid reactions using coated piezoelectric detectors
[AD-A153047] N85-29001
POLLUTION TRANSPORT
Limiting profiles in contaminant transport through porous media — ground water pollution
[REPT-84-31] N85-28282
Quality assurance for RESOLVE (Research on Operations-Limiting Visual Extinction). A visibility study in the California desert
[AD-A152383] N85-28494
POLYATOMIC MOLECULES
Crossed molecular beam studies of the reactions of oxygen and fluorine atoms
[AD-A153302] N85-28008
POLYCRYSTALS
Mechanical properties of polycrystalline alpa titanium
[BLL-BISI-TRANS-21923-(9022.06)] N85-28029
POLYGONS
Chemical applications of topology and group theory. 17: An information theoretical approach to polyhedral symmetry
[AD-A152821] N85-27995
Fourier coding and reconstruction of complicated contours
[REPT-84-39] N85-28691
POLYMER CHEMISTRY
Polyaromatic ether-sulfone-keytones with fluoro-substituted-p-cyclophane units as cross-linking sites
[AD-D011649] N85-28105
New polymers for composites: A summary of research on polystyrylpyridines
[NASA-CR-175886] N85-28106
The synthesis and structure of polyphosphazenes
[AD-A153134] N85-28112
Model for the growth of fractal silica polymers
[DE85-007884] N85-28115
POLYMER MATRIX COMPOSITES
Experiments and micromechanical models for creep-rupture in polymer matrix composites
[DE85-009533] N85-28118
POLYMERIC FILMS
Electrochemistry of polymer films not immersed in solution: Electron transfer on an ion budget
[AD-A152989] N85-27998
POLYMERIZATION
Polyaromatic ether-sulfone-keytones with fluoro-substituted-p-cyclophane units as cross-linking sites
[AD-D011649] N85-28105
Preparation of polystryene latex particles in a rotating reactor
[NASA-CR-171475] N85-28108
Model for the growth of fractal silica polymers
[DE85-007884] N85-28115
POLYMERS
Process for clarification of water
[DE85-007864] N85-28023
Application of scattering methods to the studies of the structure of polymer blends
[IFPR-13/1984] N85-28104
Development of concrete polymer materials
[DE85-005957] N85-28114
Experiments and micromechanical models for creep-rupture in polymer matrix composites
[DE85-009533] N85-28118
POLYNOMIALS
Polynomial approaches for the characteristic velocity and flame temperature as a function of mixing compounding and pressure for the systems PMMA/O2, PMMA/air, PE/O2, PE/air, PS/O2 and PS/air
[VTH-LR-421] N85-28024
Comparison of two algebraic methods for curve/curve intersection N85-28591
Polynomial iteration for nonsymmetric indefinite linear systems
[AD-A153094] N85-28671
A class of polynomials related to those of Laguerre
[CWI-AM-R8411] N85-28693
POLYSTYRENE
Preparation of polystryene latex particles in a rotating reactor
[NASA-CR-171475] N85-28108
Ac field-induced order in dense colloidal systems
[DE85-009107] N85-28119
POPULATION THEORY
The dynamical behavior of the age-size-distribution of a cell population
[CWI-AM-R8414] N85-28538
A formal analysis of the evolution of cooperation
[AD-A152539] N85-28662
Confidence intervals based on interpolated order statistics
[AD-A152607] N85-28701

POROSITY
Continued development and testing of tungsten controlled porosity dispenser cathodes
[AD-A152595] N85-28090
POROUS MATERIALS
Numerical study of porous airfoils in transonic flow
[NASA-TM-86713] N85-27828
Limiting profiles in contaminant transport through porous media --- ground water pollution
[REPT-84-31] N85-28282
High temperature composite thermal storage systems
[DE85-005073] N85-28455
POSITION (LOCATION)
Real-time position determinations using the GPS TI4100/GEOSTAR receiver
[AD-A152551] N85-27845
POSITION INDICATORS
Enhancements to the TTS-502 time transfer system N85-28296
High temperature position sensors based on monolithic GaAs Hall IC
[BMFT-FB-T-84-266] N85-28337
POSITRON ANNIHILATION
An investigation of molecular structure of copolymers using positron annihilation spectroscopy
[NASA-TM-86431] N85-27977
POTASSIUM PHOSPHATES
Rapid growth of potassium dihydrogen phosphate crystals
[DE85-007261] N85-28839
POTENTIAL ENERGY
Electronically excited alkaline earth oxides: Chemical production and collisional energy transfer processes
[AD-A153172] N85-28833
POTENTIAL FLOW
A counterpart of Faxen's formula in potential flow
[REPT-84-09] N85-28279
POTENTIAL GRADIENTS
Ohmic potential drop and gas bubble radius distribution in alkaline water electrolysis N85-28025
POTENTIAL THEORY
Field theory analysis using the finite element method to determine the deliberation curves of three dimensional fracture mechanics specimens with a semicircular surface crack applying the electrical direct current potential method for crack depth measurement
[GKSS-84/E/53] N85-28434
POTTING COMPOUNDS
Electrical research on solar cells and photovoltaic materials
[NASA-CR-175897] N85-28452
POWDER (PARTICLES)
High resolution powder diffraction
[DE85-008287] N85-28015
POWDER METALLURGY
Powder-metallurgy alloys and steels
[BLL-BISI-TRANS-22239-(9022.06)] N85-28050
Sintering and properties of metal-ceramic alloys of the Kovar type
[BLL-BISI-TRANS-21822-(9022.06)] N85-28060
Production and compaction of amorphous metal powders
[BLL-BISI-TRANS-22367-(9022.06)] N85-28080
Dispersion-strengthened powder-metallurgical chromium steels
[BLL-BISI-TRANS-22323-(9022.06)] N85-28081
POWER EFFICIENCY
Commercialization of the power factor controller
[NASA-CR-171500] N85-28221
POWER FACTOR CONTROLLERS
Commercialization of the power factor controller
[NASA-CR-171500] N85-28221
POWER SPECTRA
Rational pulse-shaping filters for almost MSK-like modulation
[AD-A153065] N85-28208
PRESBURNERS
SSME fuel preburner two-dimensional analysis N85-27943
PRECIPITATION (METEOROLOGY)
Precipitation and snow cover data, 1977
[ISBN-951-697-215-2] N85-28514
PREDICTION ANALYSIS TECHNIQUES
Predictions and measurements of isothermal flowfields in axisymmetric combustor geometries
[NASA-CR-174916] N85-27867
SRB filament wound case material property study
[NASA-CR-171469] N85-27940
Reexamination of cumulative fatigue damage laws N85-27962
VLSI (Very large scale integrated circuits) device reliability models
[AD-A153268] N85-28245
Spectral decomposition and verification of NOGAPS 500MB medium-range forecasts
[AD-A152550] N85-28520
Electronically excited alkaline earth oxides: Chemical production and collisional energy transfer processes
[AD-A153172] N85-28833
PREDICTIONS
Basic EMC technology advancement for C3 systems. Volume 4F: Prediction of crosstalk in flatpack coaxial cables
[AD-A153111] N85-28242
Improving the effectiveness of integral property calculation in a CSG solid modeling system by exploiting predictability N85-28586
PRESSING (FORMING)
Mechanizing of handling operations in drop forging with hammers and presses (conducted ergonomical examinations)
[BMFT-FB-HA-84-051] N85-28561
PRESSURE DISTRIBUTION
Aerodynamic research in preparation for a new Dutch transport aircraft with supercritical wings
[B8580077] N85-27836
Proceedings of the 9th US Air Force and the Federal Republic of Germany Data Exchange Agreement Meeting, Viscous and Interacting Flow Field Effects
[AD-A153020] N85-28266
Characteristics of a confined jet thrust vector control nozzle
[AD-A153087] N85-28268
PRESSURE EFFECTS
Thermal expansion effects in electrical transport in amorphous metals
[AD-A152477] N85-28089
Stability of cylindrical shells with variable thickness under external pressure N85-28164
A second-order pressure-correction method for viscous incompressible flow
[REPT-84-15] N85-28280
PRESSURE MEASUREMENT
Analysis of unsteady pressure measurements on a supercritical airfoil with a harmonically oscillating trailing edge flap at subsonic and transonic speeds
[DFVLR-FB-84-49] N85-27837
PRESSURE VESSELS
Fatigue strength of Inconel 625 plate and weldments used in the DIII-D configuration vacuum vessel
[DE85-008276] N85-28427
Initial performance of advanced designs for IPV nickel-hydrogen cells
[NASA-TM-87029] N85-28444
PRINTED CIRCUITS
Printed wiring board circuit isolator tool
[AD-D011638] N85-28333
PROBABILITY DENSITY FUNCTIONS
An inequality and its application to the truncated distributions N85-28673
Robust tests of mean vector in symmetrical multivariate distributions
[AD-A153116] N85-28674
PROBABILITY DISTRIBUTION FUNCTIONS
On the probability density of signal-to-noise ratio in an improved detector
[AD-A152529] N85-28232
A collection of probability distributions
[AD-A153128] N85-28704
PROBABILITY THEORY
Probabilistic structural analysis theory development N85-27955
Probabilistic finite element development N85-27956
Probabilistic structural analysis of SSME turbopump blades: Probabilistic geometry effects N85-27958
PROBLEM SOLVING
Augmented weighted diamond force of the linear nodal scheme for Cartesian coordinate systems
[DE85-005631] N85-28679
A program for solving first kind Fredholm integral equations by means of regularization
[CWI-NM-R8416] N85-28697
PROCUREMENT MANAGEMENT
Documentation for the West German Federal Cabinet's space policy decision N85-28886
PRODUCT DEVELOPMENT
Development of a fuselage forward section in Carbon Fiber Reinforced Plastic (CFRP) type of construction
[MBB/LFA34/CFK/PUB/006] N85-27851
Development of a microprocessor controlled communication system for ships
[BMFT-FB-T-84-275] N85-28216
Ceramic turbochargers: A case study of a near-term application of high-strength ceramics
[DE85-006495] N85-28379
Ultrasonic flaw detector with microcomputer interpretation
[BMFT-FB-T-84-272] N85-28395
Special topics in infrared interferometry --- Michelson interferometer development
[NASA-TM-87472] N85-28794
Further development of high voltage SIPMOS FET's to fulfill market needs
[BMFT-FB-T-84-255] N85-28843
PRODUCTION ENGINEERING
Integral profile method for production of carbon fiber sheets
[MBB/LFA34/CFK/PUB/006] N85-27975
Uses of, experiences in production of custom designed IC's N85-28180
Modern equipment for manufacture of IC's in Hungary N85-28181
Manufacturing information system
[AD-A152715] N85-28616
USSR report: Science and technology policy
[JPRS-UST-85-008] N85-28872
PRODUCTIVITY
World iron ore reserves
[BLL-BISI-TRANS-22280-(9022.06)] N85-28435
Photosynthetic acclimation of Acer saccharum
[DE85-008247] N85-28536
PROGRAM VERIFICATION (COMPUTERS)
NASA guidelines for assuring the adequacy and appropriateness of security safeguards in sensitive applications
[NASA-CR-175489] N85-28593
Software environment for conducting interactive statistical analysis
[AD-A153378] N85-28626
PROGRAMMERS
CLEANROOM software development: An empirical evaluation
[AD-A152924] N85-28619
PROGRAMMING LANGUAGES
AFIT GKS: A GKS implementation in the Ada programming language
[AD-A152954] N85-28620
PROJECT MANAGEMENT
Summer High School Apprenticeship Research Program (SHARP) of the National Aeronautics and Space Administration
[NASA-CR-175791] N85-28849
Technical services at NLR
[B8561898] N85-28871
PROJECT PLANNING
In orbit infrastructure. Volume 1: Executive summary --- European space programs
[RX011-002/84-VOL-1] N85-27928
Documentation for the West German Federal Cabinet's space policy decision N85-28886
PROPAGATION VELOCITY
Polynomial approaches for the characteristic velocity and flame temperature as a function of mixing compounding and pressure for the systems PMMA/O2, PMMA/air, PE/O2, PE/air, PS/O2 and PS/air
[VTH-LR-421] N85-28024
Proceedings of the 1980 Workshop of the International Association of Seismology and Physics of the Earth's Interior on the Seismic Modeling of Laterally Varying Structures: Contributions based on data from the 1978 Saudi Arabian refraction profile
[GS-CIRC-937] N85-28476
Preliminary interpretation of Saudi Arabian seismic refraction data N85-28477
A preliminary examination of the 1978 refraction profiles in Saudi Arabia N85-28482
The rifted margin of Saudi Arabia N85-28483
On the propagation speed in relativistic quantum mechanics
[CWI-AM-R8410] N85-28848
PROPULSION SYSTEM CONFIGURATIONS
Future fundamental combustion research for aeropropulsion systems
[NASA-TM-87049] N85-27870
The STOL and maneuver technology program integrated control system development N85-27910
The Department of Defense statement on the Science and Technology Program by Colonel Donald I. Carter, USAF Acting Deputy Under Secretary of Defense for Research and Advanced Technology before the Subcommittee on Research and Development of the Committee on Armed Services of the United States House of Representatives, 99th Congress, first session
[AD-A152467] N85-28850
PROPULSION SYSTEM PERFORMANCE
Test devices for aeronautical research and technology
[NASA-TM-77651] N85-27914
PROPULSIVE EFFICIENCY
Propulsion efficiency of vibrating bodies in subsonic gas stream N85-28159
PROTECTIVE COATINGS
Testing of materials and coatings for jet engine components under simulated operational conditions
[B8580073] N85-27873
Properties of chromate coatings formed on electrolytic zinc substrates
[BLL-BISI-TRANS-22349-(9022.06)] N85-28052

New process for production of bimetal with corrosion-resistant cladding layer
[BLL-BISI-TRANS-22371-(9022.06)] N85-28056
Erosion of corrosion-resistant surface treatments on alloy steels
[DE85-008446] N85-28100
New air-curing lacquer systems with high solids content
[BMFT-FB-T-85-005] N85-28124
Technology development for thin-film-trace humidity sensors
[BMFT-FB-T-84-268] N85-28338
Proper quality of anticorrosion work no matter how bad the atmospheric conditions
[BLL-BISI-TRANS-22080-(9022.06)] N85-28383

PROTEINS
Progress, goals in biotechnology summarized N85-28182

PROTOCOL (COMPUTERS)
A secure high-speed transaction protocol
[CWI-CS-R8417] N85-28605

PROTONS
East Europe report: Science and technology
[JPRS-ESA-85-017] N85-28177
Proton induced X-ray emission method, its application in analytics N85-28178
Experiments with light ions at CERN super proton synchrotron
[DE85-007625] N85-28744
Cluster production and entropy
[DE85-007626] N85-28752

PROVING
Peer Review of a Formal Verification/Design Proof Methodology
[NASA-CP-2377] N85-28609

PSYCHOLOGICAL EFFECTS
Mechanizing of handling operations in drop forging with hammers and presses (conducted ergonomical examinations)
[BMFT-FB-HA-84-051] N85-28561

PSYCHOLOGICAL TESTS
Construction of a job-oriented test for the selection of air traffic controllers
[DFVLR-FB-84-51] N85-28558

PSYCHOMOTOR PERFORMANCE
Performance Evaluation Tests for Environmental Research (PETER) evaluation of 112 measures
[AD-A152317] N85-28543
Biofeedback and performance: An update
[AD-A153228] N85-28553

PUBLIC HEALTH
Biological and human health effects of extremely low frequency electromagnetic fields. Post-1977 literature review
[AD-A152731] N85-28539

PUBLIC RELATIONS
Origin, processing, and dissemination of scientific news, with examples from 20 research institutes
[JUEL-1940] N85-28882

PULSE AMPLITUDE
Acoustooptic pulse-echo transducer system
[NASA-CR-175919] N85-28224

PULSE COMMUNICATION
Rational pulse-shaping filters for almost MSK-like modulation
[AD-A153065] N85-28208
Measured noise performance of a new method of frequency hopping
[AD-A152679] N85-28234

PULSE COMPRESSION
Rational pulse-shaping filters for almost MSK-like modulation
[AD-A153065] N85-28208

PULSED LASERS
X-ray crystallography of steel U8 after pulsed laser hardening
[BLL-BISI-22444-(9022.06)] N85-28038
Obtaining amorphous coatings of FeW and Fe-Cr-P-B alloys using laser sputtering
[BLL-BISI-22493-(9022.06)] N85-28057

PUMPS
Flat magnetohydrodynamic induction pump N85-28145
Dependence of characteristics of centrifugal magnetohydrodynamic conduction pump on electrical conductance of end walls. Part 1: Experiment N85-28146

PURIFICATION
Process for clarification of water
[DE85-007864] N85-28023

PURSUIT TRACKING
Pursuit tracking performance and flash disruption: The effects of training 'the non-dominant eye on target reacquisition
[AD-A153404] N85-28541

PYRIDINES
New polymers for composites: A summary of research on polystyrylpyridines
[NASA-CR-175886] N85-28106

PYROLYSIS
Preparation of silicon carbide-silicon nitride fibers by the pyrolysis of polycarbosilazane precursors
[NASA-TM-86505] N85-28107

PYROTECHNICS
Evaluation of pyrotechnic fire suppression system for six pyrotechnic compositions
[AD-A152995] N85-28130

Q

QUALITY CONTROL
Examination of steels by chemical analysis for quality assurance
[BLL-BISI-TRANS-22068-(9022.06)] N85-28074
Proper quality of anticorrosion work no matter how bad the atmospheric conditions
[BLL-BISI-TRANS-22080-(9022.06)] N85-28383
Statistical models used in analyzing the quality of welded tubes
[BLL-BISI-TRANS-22232-(9022.06)] N85-28384
Principal quality assurance measures in the manufacture of HF-welded high-pressure linepipe
[BLL-BISI-TRANS-21690-(9022.06)] N85-28389
Integrating quality assurance and research and development
[DE85-007974] N85-28392
Initial imperfection surveys on conical shells at Hoechst AG
[VTH-LR-407] N85-28429
Quality assurance for RESOLVE (Research on Operations-Limiting Visual Extinction). A visibility study in the California desert
[AD-A152383] N85-28494
Effects of inspection errors on curtailed Dorfman-type procedures
[AD-A152376] N85-28699
Statistical effects of imperfect inspection sampling. Part 2: Double sampling, link sampling and grading
[AD-A152377] N85-28700
Impurity control and vacuum pumping system design and analysis for next-generation Tokamaks
[DE85-009291] N85-28815

QUANTUM CHROMODYNAMICS
Photon structure function: Theory
[DE85-008064] N85-28745
Measuring structure functions at SSC energies
[DE85-007515] N85-28746
Experimental studies of diffractive phenomena
[DE85-006812] N85-28749
Elementary particle theory
[DE85-006803] N85-28771
Heavy quark production processes in QCD
[DE85-007240] N85-28779

QUANTUM ELECTRODYNAMICS
Elementary particle theory
[DE85-006803] N85-28771

QUANTUM MECHANICS
Memory function for cyclotron resonance of two-dimensional electron systems
[AD-A152632] N85-28731
Nonrelativistic theory of heavy-ion collisions
[DE85-007538] N85-28747
The strategy for time dependent quantum mechanical calculations using a Gaussian wave packet representation of the wave function
[AD-A152709] N85-28845
On the propagation speed in relativistic quantum mechanics
[CWI-AM-R8410] N85-28846

QUANTUM NUMBERS
Proposal for the systematic naming of mesons and baryons
[DE85-008453] N85-28773

QUANTUM THEORY
The enhancement of molecular fluorescence and photochemistry by small metal particles
[AD-A152740] N85-27994

QUARKS
Heavy quark production processes in QCD
[DE85-007240] N85-28779
Experimental methods of heavy quark detection
[DE85-006316] N85-28781

QUARTZ
A new precision time and frequency source for stationary PTTI applications N85-28297

QUARTZ CRYSTALS
Cut angles for quartz crystal resonators
[AD-D011652] N85-28220
Acceleration insensitive oscillator
[AD-D011621] N85-28236
Crystal resonator/oscillator test facility and test results N85-28322

QUASARS
A new luminosity component in 3C48
[NASA-CR-175840] N85-28894

QUATERNIONS
Use of quaternions in flight mechanics
[AD-A152616] N85-27875

QUENCHING (COOLING)
Thermomechanical softening treatment for bearing and tool steels
[BLL-BISI-TRANS-22432-(9022.06)] N85-28035
The state of martensite after quenching in a magnetic field
[BLL-BISI-TRANS-22297-(9022.06)] N85-28051

R

RADAR
An analysis of the economic impact of the AN/APS-134 FLAR (Forward Looking Airborne Radar) retrofit on Coast Guard HC-130 aircraft
[AD-A152619] N85-28204
Survivable ground base sensor
[AD-D011647] N85-28213

RADAR ANTENNAS
Performance analysis of the DSN baseband assembly (Bba) Real-Time Combiner (RTC)
[NASA-CR-175877] N85-28193

RADAR APPROACH CONTROL
Investigation of imaging and flight guidance concepts for rotorcraft zero visibility approach and landing
[NASA-CR-166571] N85-27843

RADAR DETECTION
Survivable ground base sensor
[AD-D011647] N85-28213
Convective storm downdraft outflows detected by NASA/MSFC's Airborne 10.6 micron pulsed Doppler Lidar System
[NASA-CR-3898] N85-28511

RADAR ECHOES
Statistical comparison of radar echoes of convective precipitation between the northern Alps and its foreland
[DFVLR-FB-85-07] N85-28215

RADAR IMAGERY
Investigation of imaging and flight guidance concepts for rotorcraft zero visibility approach and landing
[NASA-CR-166571] N85-27843
Evaluation of Defense Mapping Agency level 1 second edition digital data for training simulator applications
[AD-A152444] N85-28437
Application of artificial intelligence (AI) to radar image understanding
[AD-A152519] N85-28654
Further study of digital matching of dissimilar images
[AD-A153112] N85-28672

RADAR RECEPTION
Survivable ground base sensor
[AD-D011647] N85-28213

RADAR SIGNATURES
Hardware test program for evaluation of baseline range/range rate sensor concept
[NASA-CR-175910] N85-28194

RADAR TARGETS
Hardware test program for evaluation of baseline range/range rate sensor concept
[NASA-CR-175910] N85-28194
Digital methods of the optimum processing of radar signals
[AD-A152469] N85-28202

RADIANT FLUX DENSITY
Microwave responses of the western North Atlantic
[NASA-CR-175888] N85-28191

RADIATION DAMAGE
ELF (Extremely Low Frequency) communications system ecological monitoring program: Measurements of ELF electromagnetic fields for site selection and characterization, 1983
[AD-A153120] N85-28209

RADIATION DETECTORS
Magnetic monopoles
[DE85-008176] N85-28710
Experiments and detectors for high energy heavy ion colliders
[DE85-007927] N85-28748

RADIATION DOSAGE
Energy and Technology Review
[DE85-004358] N85-28868

RADIATION EFFECTS
In situ HVEM studies of electron beam-driven composition changes in thin film alloys: Displacement-rate gradient effects
[DE85-007992] N85-28092

Biological and human health effects of extremely low frequency electromagnetic fields. Post-1977 literature review
[AD-A152731] N85-28539

RADIATION MEASUREMENT
Measurement and interpretation of electron angle at MABE beam stop
[DE85-008583] N85-28755

RADIATION MEASURING INSTRUMENTS
Results from radiation monitoring equipment experiment on STS-8
[AD-A153241] N85-28911

RADIATION SOURCES
Supersonic flow around weak radiation sources N85-28162

RADIATIVE HEAT TRANSFER
Performance analysis of radiation cooled dc transmission lines for high power space systems
[NASA-TM-87040] N85-28222

RADIATIVE TRANSFER
Solar radiance models for determination of ERBE scanner filter factor
[NASA-CR-172595] N85-28513

RADICALS
The electronic spectra of phthalocyanine radical anions and cations
[AD-A152328] N85-27986
Measurement of Franck-Condon factors for the v'=0 progression in the B-X system of PO
[AD-A152734] N85-27993
Cometary atmospheres: Modeling the spatial distribution of observed neutral radicals
[NASA-CR-175682] N85-28904

RADII
Ohmic potential drop and gas bubble radius distribution in alkaline water electrolysis N85-28025

RADIO BURSTS
Electron-cyclotron maser emission during solar and stellar flares
[NASA-CR-175883] N85-28907

RADIO COMMUNICATION
Mobile television radio link
[AD-A152381] N85-28201

RADIO FREQUENCY HEATING
The design of megawatt gyrotrons
[DE85-007892] N85-28754
Electron-cyclotron maser emission during solar and stellar flares
[NASA-CR-175883] N85-28907

RADIO RECEIVERS
The R-809 radio set
[AD-A152370] N85-28200
UHF IRIG G distribution system N85-28308

RADIO TRANSMISSION
A transport theory of millimeter wave propagation in woods and forests
[AD-A151883] N85-28196

RADIO TRANSMITTERS
The R-809 radio set
[AD-A152370] N85-28200
UHF IRIG G distribution system N85-28308

RADIO WAVE REFRACTION
Saudi Arabian refraction profile: Crustal structure of the Red Sea-Arabian Shield transition N85-28484

RADIO WAVES
Scintillation using NNSS satellites
[AD-A152804] N85-28207

RADIOACTIVE DECAY
Theoretical basis for the determination of the concentration of radon decay products in air from the activity of a particulate air sample
[IRI-190-83-07] N85-28774
Model computations of radon, and radon decay product, concentrations in an open system; the Hewlett-Packard 41C program RNSS, version 02
[IRI-190-83-12] N85-28775
Theoretical studies of high energy phenomenon: Analysis of models of CP and T violation
[DE85-007455] N85-28782

RADIOACTIVE MATERIALS
Scanning electron microscope facility for examination of radioactive materials
[DE85-008127] N85-28335

RADIOACTIVE WASTES
Physical-chemical model for the mechanism of glass corrosion with particular consideration of simulated radioactive waste glasses
[DE85-007713] N85-28121

RADIOMETERS
Radiometer integrated into a communication terminal
[AD-A151746] N85-28195
Water vapor radiometry research and development phase
[NASA-CR-175887] N85-28512

RADON ISOTOPES
Theoretical basis for the determination of the concentration of radon decay products in air from the activity of a particulate air sample
[IRI-190-83-07] N85-28774
Model computations of radon, and radon decay product, concentrations in an open system; the Hewlett-Packard 41C program RNSS, version 02
[IRI-190-83-12] N85-28775

RAILGUN ACCELERATORS
Examination of a method for predicting the properties of railgun plasmas
[AR-004-322] N85-28799

RAIN
Statistical comparison of radar echoes of convective precipitation between the northern Alps and its foreland
[DFVLR-FB-85-07] N85-28215

RAMAN LASERS
Raman studies of laser damaged single and multi-layer optical coatings
[DE85-009431] N85-28351

RAMAN SPECTROSCOPY
Raman studies of laser damaged single and multi-layer optical coatings
[DE85-009431] N85-28351
Studies of optical-beam phase-conjugation by nonlinear refraction
[AD-A152865] N85-28788
Recent advances in optical measurement methods in physics and chemistry
[DE85-008695] N85-28792
Properties of defects in Hg(1-x)Cd(x)Te
[AD-A153243] N85-28835

RANDOM ACCESS MEMORY
The design of an adaptive predictive coder using a single-chip digital signal processor
[AD-A152461] N85-28231
Random access memory technologies
[AD-A153089] N85-28597

RANDOM LOADS
First passage times for combinations of random loads
[AD-A153275] N85-28423

RANDOM NOISE
On the probability density of signal-to-noise ratio in an improved detector
[AD-A152529] N85-28232

RANDOM VARIABLES
A bilaterally deterministic rho-mixing stationary random sequence
[AD-A152856] N85-28666
Central limit theorems in the area of large deviations for some dependent random variables
[AD-A153125] N85-28831

RANDOM WALK
A trivariate version of Levy's equivalence
[AD-A153157] N85-28705

RANGE (EXTREMES)
An empirical comparison of the accuracy of univariate and multivariate corrections for range restriction
[AD-A153071] N85-28670

RARE EARTH COMPOUNDS
Microstructure and mechanical properties of rare-earths-microalloyed high-speed tool steel
[BLL-BISI-TRANS-22043-(9022.06)] N85-28064

RARE EARTH ELEMENTS
The influence of melting practice and of microalloying, with rare earth metals and with boron, on the quality of low-carbon steel
[BLL-BISI-22467-(9022.06)] N85-28036
The corrosion resistance of chromium-nickel steel containing rare-earth metals
[BLL-BISI-TRANS-22477-(9022.06)] N85-28041
Inoculation of non-metallic inclusions in steel 17GC
[BLL-BISI-TRANS-22431-(9022.06)] N85-28042

RATES (PER TIME)
Removal of longitudinal internal flash from electrically welded tubes
[BLL-BISI-TRANS-22380-(9022.06)] N85-28136
Inequalities for distributions with increasing failure rate
[AD-A152812] N85-28390

RATIOS
Fuzzy hierarchical analysis
[DE85-008149] N85-28685

RAY TRACING
Saudi Arabian refraction profile: Crustal structure of the Red Sea-Arabian Shield transition N85-28484
Saudi Arabian refraction profile: A preliminary interpretation for the Red Sea-Arabian Shield transition N85-28485
A preliminary analysis of the Saudi Arabian deep seismic sounding data N85-28489
The addition of advanced scene rendering techniques to a general purpose graphics package
[AD-A153323] N85-28625
Ray tracing general sweep defined objects
[REPT-84-36] N85-28636

REACTION BONDING
Research and developmental study on MIS thin film solar cells of amorphous hydrogenated silicon, part 2
[BMFT-FB-T-84-290] N85-28467

REACTION KINETICS
The spectroscopy and reaction kinetics of coordinated unsaturated metal carbonyls
[AD-A153079] N85-28003
Elementary reactions of importance in oxidation, combustion ignition and flame inhibitions
[AD-A153139] N85-28004
Kinetics of hydrolysis and products of hydrolysis and photolysis of tetryl
[AD-A153144] N85-28005
Study of self-propagating condensed phase reactions TiB(2) synthesis
[AD-A153198] N85-28006
Kinetics of the formation of a complex alloyed boride coating on iron and its properties
[BLL-BISI-TRANS-22303-(9022.06)] N85-28084
Rotational relaxation studies of hydrogen fluoride
[AD-A152711] N85-28734
Rapid growth of potassium dihydrogen phosphate crystals
[DE85-007261] N85-28839

REACTOR DESIGN
Tokamak fusion core experiment maintenance study
[DE85-008040] N85-28813

REACTOR MATERIALS
Differential between crack and pseudo-crack indications by means of objective magnetic flux leakage testing
[BLL-BISI-TRANS-22033-(9022.06)] N85-28386

REAL TIME OPERATION
Data processing on the rotor test stand at DFVLR in Brunswick: Microprogrammable interfaces and array processor as key components in a PDP 11 real time data acquisition and processing system
[DFVLR-MITT-85-03] N85-27921
Performance analysis of the DSN baseband assembly (Bba) Real-Time Combiner (RTC)
[NASA-CR-175877] N85-28193
The design of an adaptive predictive coder using a single-chip digital signal processor
[AD-A152461] N85-28231
Real-Time Multiprocessor Programming Language (RTMPL) user's manual
[NASA-TP-2422] N85-28610
Optimal design and use of retry in fault tolerant real-time computer systems
[NASA-CR-175920] N85-28643
Synchronization and fault-masking in redundant real-time systems
[NASA-TM-87478] N85-28644
A real-time executive for multiple-computer clusters
[AD-A152961] N85-28646

RECEIVERS
Real-time position determinations using the GPS TI4100/GEOSTAR receiver
[AD-A152551] N85-27845

RECOMBINATION REACTIONS
Experimental approaches to the measurement of dielectronic recombination
[DE85-00627] N85-28743

RECRYSTALLIZATION
Thin films properties of sputtered niobium silicide on SiO2, Si3N4 and on n+ poly-Si
[AD-A152378] N85-28228

RECTANGULAR PLATES
Biaxial buckling of specially orthotropic, symmetric composite rectangular plates
[AD-A152958] N85-28417

RECURSIVE FUNCTIONS
Applied Kalman filtering: An overview N85-28313

RED SEA
Saudi Arabian refraction profile: Crustal structure of the Red Sea-Arabian Shield transition N85-28484
Saudi Arabian refraction profile: A preliminary interpretation for the Red Sea-Arabian Shield transition N85-28485
A traveltime interpretation of the 1978 seismic refraction profile in the Kingdom of Saudi Arabia N85-28486
Explanation of Russian models: Saudi Arabian seismic refraction profile N85-28487
Interpretation of the data of USGS seismic refraction profile across the Arabian Shield in western Saudi Arabia N85-28488
One-dimensional velocity-depth functions determined for the Arabian Shield and the southwestern Red Sea: A comparison of models N85-28490
A comparison of crustal sections: Arabian Shield to the Red Sea N85-28491

REDUCED GRAVITY
Free-surface phenomena under low- and zero-gravity conditions
[NASA-CR-175885] N85-27922

Fluid surface behavior in low gravity. Center discretionary fund no. 83-21
[NASA-TP-2486] N85-28260

REDUCTION (CHEMISTRY)
Bifunctional oxygen electrodes
[DE85-006871] N85-28248

REDUNDANCY
A modular dissimilar redundant computer designed for high integrity control N85-27904
Synchronization and fault-masking in redundant real-time systems
[NASA-TM-87478] N85-28644

REDUNDANT COMPONENTS
Synchronization and fault-masking in redundant real-time systems
[NASA-TM-87478] N85-28644

REFLECTANCE
Technique for measuring the effective source reflection coefficient of 2-resistor power splitters
[DE85-009964] N85-28256
Light scattering by leaf layers with application to canopy reflectance modeling: The Scattering by Arbitrarily Inclined Leaves (SAIL) model
[NLR-MP-84011-U] N85-28796

REFLECTORS
The weighting function for scintillation on a folded path
[AD-A152659] N85-28206
Echo-response from crack-like two-dimensional reflectors in focused ultrasonic fields N85-28724

REFRACTED WAVES
Saudi Arabian refraction profile: A preliminary interpretation for the Red Sea-Arabian Shield transition N85-28485
A traveltime interpretation of the 1978 seismic refraction profile in the Kingdom of Saudi Arabia N85-28486
Explanation of Russian models: Saudi Arabian seismic refraction profile N85-28487
Interpretation of the data of USGS seismic refraction profile across the Arabian Shield in western Saudi Arabia N85-28488
A preliminary analysis of the Saudi Arabian deep seismic sounding data N85-28489
One-dimensional velocity-depth functions determined for the Arabian Shield and the southwestern Red Sea: A comparison of models N85-28490

REFRACTION
High precision materials characterization in the near millimeter wave-length range
[AD-A153267] N85-28331

REFRACTIVITY
Proceedings of the 1980 Workshop of the International Association of Seismology and Physics of the Earth's Interior on the Seismic Modeling of Laterally Varying Structures: Contributions based on data from the 1978 Saudi Arabian refraction profile
[GS-CIRC-937] N85-28476
A crustal section for the Arabian Shield and adjacent Red Sea margin derived from first-arrival data N85-28480
A seismic refraction profile across the Arabian Shield N85-28481
A preliminary examination of the 1978 refraction profiles in Saudi Arabia N85-28482
An assessment of atmospheric refractivity in the northern marginal ice zone
[AD-A152346] N85-28493
Optical waveguide characterization using grating couplers
[AD-A153063] N85-28789

REFRACTORY MATERIALS
High temperature fracture mechanics of silicon nitride
[BMFT-FB-T-84-285] N85-28433

REFRACTORY METAL ALLOYS
Obtaining amorphous coatings of FeW and Fe-Cr-P-B alloys using laser sputtering
[BLL-BISI-22493-(9022.06)] N85-28057

REFUELING
Inspection evaluation and repair of the flawed feedwater nozzle of the 50 MWe Dodewaard GKN boiling water reactor
[ISBN-90-353-0017-3] N85-28394

REGRESSION ANALYSIS
Surveillance report. Stage 1: Dissected motors-propellants motor number 0012199, phase 15
[AD-A153206] N85-27973
MM2 LRSLA testing stage 3 propellant
[AD-A152540] N85-28128
The measurement of linear frequency drift in oscillators N85-28316
Robust regression through robust covariances
[AD-A153301] N85-28677
Fuzzy hierarchical analysis
[DE85-006149] N85-28685
A multiple regression technique for detecting outliers
[REPT-84-33] N85-28706

REGULATIONS
Gordon Research Conference on Composites
[AD-A152888] N85-27979

REINFORCED SHELLS
Natural vibrations of reinforced spherical shells N85-28165
Method of solving problems of statics for multilayer shells of revolution N85-28167

REINFORCING FIBERS
Preparation of silicon carbide-silicon nitride fibers by the pyrolysis of polycarbosilazane precursors
[NASA-TM-86505] N85-28107

REINFORCING MATERIALS
Anticorrosion protection of reinforcing steel in prestressed gypsum and anhydrite concrete
[BLL-BISI-TRANS-22079-(9022.06)] N85-28044

RELATIVISTIC VELOCITY
On the propagation speed in relativistic quantum mechanics
[CWI-AM-R8410] N85-28848

RELAXATION (MECHANICS)
Relaxation properties and fatigue fracture resistance of austenitic spring steel
[BLL-BISI-TRANS-22300-(9022.06)] N85-28406

RELAXATION TIME
Rotational relaxation studies of hydrogen fluoride
[AD-A152711] N85-28734

RELIABILITY
VLSI (Very large scale integrated circuits) device reliability models
[AD-A153268] N85-28245
Test and evaluation plan for the Centralized Storm Information System N85-28508

RELIABILITY ANALYSIS
Performance evaluation of fiber-optic converters N85-28154
Engineering significance of fatigue thresholds and short fatigue cracks for structural design
[NLR-MP-84001-U] N85-28430
There is no I/O like no I/O
[DE85-009115] N85-28634

RELOCATION
Predictors of transfer adjustment: A longitudinal study
[AD-A152462] N85-28548

REMOTE CONTROL
Scanning electron microscope facility for examination of radioactive materials
[DE85-008127] N85-28335

REMOTE HANDLING
Tokamak fusion core experiment maintenance study
[DE85-008040] N85-28813

REMOTE SENSING
Test devices for aeronautical research and technology
[NASA-TM-77651] N85-27914
Earth observation modeling based on layer scattering matrices
[NLR-MP-84015-U] N85-28440
Developments in remote sensing
[B8580069] N85-28441
Convective storm downdraft outflows detected by NASA/MSFC's Airborne 10.6 micron pulsed Doppler Lidar System
[NASA-CR-3898] N85-28511
Light scattering by leaf layers with application to canopy reflectance modeling: The Scattering by Arbitrarily Inclined Leaves (SAIL) model
[NLR-MP-84011-U] N85-28796
Experimental philosophy leading to a small scale digital data base of the conterminous United States for designing experiments with remotely sensed data
[NASA-TM-85009] N85-28877

REMOVAL
The behaviour of nitride inclusions in nickel-base alloys
[BLL-BISI-TRANS-22396-(9022.06)] N85-28058

REPORTS
USSR report: Transportation
[JPRS-UTR-84-025] N85-27841
Experimental plasma research: Plasma summaries
[DE85-008116] N85-28805

REQUIREMENTS
USAF damage tolerant design handbook: Guidelines for the analysis and design of damage tolerant aircraft structures, revision B
[AD-A153161] N85-27858
Steel Tubes
[BLL-BISI-TRANS-22064-(9022.06)] N85-28360
Functional and performance requirements of the next NOAA-Kasas City computer system N85-28510

RESEARCH
Magnetic monopoles
[DE85-008176] N85-28719
Laboratory research: A question of when, not if
[AD-A153298] N85-28867
Catalog of research projects at Lawrence Berkeley Laboratory, 1985
[DE85-008679] N85-28809

RESEARCH AIRCRAFT
X-29 digital flight control system design N85-27889
The flight control system for the Experimental Aircraft Programme (EAP) demonstration aircraft N85-27908

RESEARCH AND DEVELOPMENT
Activities in aerospace N85-27821
Test devices for aeronautical research and technology
[NASA-TM-77651] N85-27914
Gordon Research Conference on Composites
[AD-A152888] N85-27979
Integrating quality assurance and research and development
[DE85-007974] N85-28392
Experimental plasma research: Plasma summaries
[DE85-008116] N85-28805
The Department of Defense statement on the Science and Technology Program by Colonel Donald I. Carter, USAF Acting Deputy Under Secretary of Defense for Research and Advanced Technology before the Subcommittee on Research and Development of the Committee on Armed Services of the United States House of Representatives, 99th Congress, first session
[AD-A152467] N85-28650
Multicriteria decision analysis as an aid to strategic planning of energy research and development
[REPT-84-02] N85-28870
Bibliography of Lewis Research Center technical publications announced in 1984
[NASA-TM-87012] N85-28876

RESEARCH FACILITIES
Nucleon-nucleon program at TRIUMF
[DE85-900430] N85-28756
Origin, processing, and dissemination of scientific news, with examples from 20 research institutes
[JUEL-1940] N85-28882

RESEARCH MANAGEMENT
Wind energy systems: Program summary for fiscal year, 1983
[DE85-002927] N85-28451
Nucleon-nucleon program at TRIUMF
[DE85-900430] N85-28756
Air Force technical objective document FY 86
[AD-A152730] N85-28855
Science and Technology in the Soviet Union
[AD-A152828] N85-28856
The outlook for Soviet advanced technologies
[AD-P004564] N85-28859
Social and political problems in Soviet basic research
[AD-P004565] N85-28860
Close encounters with S/T (science and technology) in the Soviet Union
[AD-P004570] N85-28864
R/D contracts in the Soviet Union
[AD-P004569] N85-28865
Laboratory research: A question of when, not if
[AD-A153298] N85-28867

RESEARCH VEHICLES
Test plan for acceptance, verification and performance testing of the Bedford Lucas Chloride Electric Van. Part 1: Acceptance and verification testing at EG and G Automotive Research. Part 2: INEL performance testing, revision 1
[DE85-005157] N85-28888

RESERVES
World iron ore reserves
[BLL-BISI-TRANS-22280-(9022.06)] N85-28435

RESIDUAL STRESS
Local heat treatment of welded joints of pipes and rotary vessels N85-28028
X-ray diffraction study of changes in stress-strain distributions during fatigue of a 2-phase alloy
[AD-A152367] N85-28087
An X-ray diffraction study of the residual stress-strain distribution in shot-peened 2-phase brass
[AD-A152418] N85-28088
Local heat treatment of welded joints of pipes and rotary vessels
[BLL-BISI-TRANS-22197-(9022.06)] N85-28354
Cyclic torsion of a circular cylinder and its residual stress distribution
[AD-A153347] N85-28424

RESISTORS
Derated application of parts for (Electronic Systems Division) systems development. Revision
[AD-A153299] N85-28248
Technique for measuring the effective source reflection coefficient of 2-resistor power splitters
[DE85-009964] N85-28256
Morphology of GaAs/sub 1-x/P/sub x/ superlattices grown by MOCVD and chloride VPE
[DE85-002944] N85-28842

RESONANCE
Resonance ionization mass spectrometry of carbon
[DE85-009040] N85-28018
Transverse electron resonance accelerator
[DE85-008289] N85-28758
RESONANCE FLUORESCENCE
The enhancement of molecular fluorescence and photochemistry by small metal particles
[AD-A152740] N85-27994
RESONANT FREQUENCIES
Acoustic oscillations of rods and plates N85-28170
RESONANT VIBRATION
Solar array flight experiment
[NASA-TM-86506] N85-27935
RESONATORS
Cut angles for quartz crystal resonators
[AD-D011652] N85-28220
High performances from a new design of crystal oscillator N85-28318
Design of SC cut 10 MHZ H.Q. crystals with G. sensitivity better than 2.10(-10)/G N85-28319
Crystal resonator/oscillator test facility and test results N85-28322
The superconducting cavity stability ruby maser oscillator N85-28324
RESOURCES MANAGEMENT
Navy geothermal plan
[AD-A152478] N85-28450
RESPONSES
Controller requirements for uncoupled aircraft motion, volume 2
[AD-A153300] N85-27879
RETENTION (PSYCHOLOGY)
Oral discussion, group-to-individual transfer and achievement in cooperative learning groups
[AD-A153209] N85-28552
REUSABLE ROCKET ENGINES
Structural Integrity and Durability of Reusable Space Propulsion Systems
[NASA-CP-2381] N85-27941
REVERSE FIELD PINCH
Two-dimensional TBR calculations for conceptual compact reversed-field pinch reactor blanket
[DE85-007636] N85-28812
REYNOLDS NUMBER
Flat magnetohydrodynamic induction pump N85-28145
RING LASERS
Measurements of laser gyro errors as a function of the beam path
[DFVLR-FB-85-02] N85-28336
RITZ AVERAGING METHOD
A study of internal and distributed damping for vibrating turbomachiner blades
[NASA-CR-175901] N85-27868
ROADS
A greedy algorithm for the transhipment along a single road problem
[AD-A152343] N85-28709
ROBOTICS
Automation and robotics for the National Space Program
[NASA-CR-175861] N85-27936
Engineering robot actions in a computer integrated manufacturing environment
[CWI-CS-R8415] N85-28139
USSR report: Machine tools and metalworking equipment
[JPRS-UMM-84-014] N85-28188
Applications of robots in machine tool industry reviewed N85-28189
Robotic safety systems and methods: Savannah River site
[DE85-008261] N85-28375
ROBOTS
Robots, automatic devices inside VW's Wolfsburg plant N85-28186
Future directions of robotics, automation in Italy N85-28187
ROBUSTNESS (MATHEMATICS)
Robust regression through robust covariances
[AD-A153301] N85-28677
RODS
Acoustic oscillations of rods and plates N85-28170
ROLL
Perception of roll rate from an artificial horizon and peripheral displays
[VTH-LR-403] N85-28557
ROOM TEMPERATURE
Strength and failure analysis of composite laminates with holes at room and elevated temperatures
[AD-A153263] N85-27981
ROOT-MEAN-SQUARE ERRORS
Clock characterization tutorial N85-28311
ROOTS OF EQUATIONS
Convergence of Newton's method for a single real equation
[NASA-TP-2489] N85-28656
ROSSBY REGIMES
The effect of the Benthic Boundary Layer on the physics of intense mesoscale eddies
[AD-A153193] N85-28270
ROTARY STABILITY
Influence of materials creep on rotor dynamics
[DE85-008545] N85-28426
ROTARY WING AIRCRAFT
Rotorcraft research testing in the National Full-Scale Aerodynamics Complex at NASA Ames Research Center
[NASA-TM-86687] N85-27854
ROTATING CYLINDERS
The Mises yield condition for thin rotationally symmetric shells
[BLL-BISI-TRANS-22047-(9022.06)] N85-28409
ROTATING FLUIDS
Boundary layer and parabolic flows
[DFVLR-FB-84-46] N85-28285
ROTATION
Use of quaternions in flight mechanics
[AD-A152616] N85-27875
Influence of materials creep on rotor dynamics
[DE85-008545] N85-28426
Efficient parallel solution of linear systems with hyperbolic rotations
[AD-A152355] N85-28661
ROTOR AERODYNAMICS
Operating characteristics of a 0.87 kW-hr
[NASA-TM-87038] N85-28371
ROTOR BLADES (TURBOMACHINERY)
Ice shapes and the resulting drag increase for a NACA 0012 airfoil
[NASA-TM-83556] N85-27839
ROTORS
Vibrations of rotors connected through couplings with backlash N85-28147
Influence of materials creep on rotor dynamics
[DE85-008545] N85-28426
RUBBER COATINGS
Anticorrosion protection of reinforcing steel in prestressed gypsum and anhydrite concrete
[BLL-BISI-TRANS-22079-(9022.06)] N85-28044
RUBIDIUM
Physics element design aspects for a tactical rubidium frequency standard N85-28321
RUNGE-KUTTA METHOD
On the algebraic equations in implicit Runge-Kutta methods
[CWI-NM-R8413] N85-28696
RUPTURING
Limiting values of stress state index after rupture of metals
[BLL-BISI-TRANS-22293-(9022.06)] N85-28407
RUSTING
Forming of coating protection system: Mechanism of paint-coating anti-corrosion protection of steel
[BLL-BISI-TRANS-22081-(9022.06)] N85-28033

S

SAFETY
Space Station crew safety alternatives study. Volume 5: Space Station safety plan
[NASA-CR-3858] N85-27930
SAFETY DEVICES
Robotic safety systems and methods: Savannah River site
[DE85-008261] N85-28375
SALINITY
The effects of sea water and concentrated salt solutions on the fatigue of nylon 6,6 fibers N85-28416
SAMPLING
Statistical effects of imperfect inspection sampling. Part 2: Double sampling, link sampling and grading
[AD-A152377] N85-28700
Estimating random integrals from noisy observations: Sampling designs and their performance
[AD-A152926] N85-28702
SANDWICH STRUCTURES
Method of solving problems of statics for multilayer shells of revolution N85-28167
SAPPHIRE
Incident beam polarization for laser Doppler velocimetry employing a sapphire cylindrical window
[NASA-TM-87064] N85-28786
SATELLITE ANTENNAS
Ionospheric effects on antenna impedance
[BMFT-FB-W-84-052] N85-28217
SATELLITE ATTITUDE CONTROL
Maximizing the semi-major axis for a freely coning solar sailcraft
[AD-A153175] N85-27938
SATELLITE CONTROL
The steering of GPS time N85-28301
Timing of spacecraft date: Time accuracy requirements and timing facilities of the European Space Agency (ESA) N85-28307
SATELLITE DESIGN
Shuttle-tethered satellite system definition study. Volume 1: Executive study
[NASA-CR-171474] N85-27924
IRAS: Space technology from the Netherlands
[B85101841] N85-27929
SATELLITE NAVIGATION SYSTEMS
CPS navigation experiment using high precision GPS timing receivers N85-28299
SATELLITE ORBITS
Analytical generation of satellite orbits at the RAE (Royal Aircraft Establishment)
[AD-A152655] N85-28901
SATELLITE PERTURBATION
The study of the physics of cometary nuclei
[NASA-CR-175917] N85-28905
SATELLITE TRACKING
A new precision time and frequency source for stationary PTTI applications N85-28297
CPS navigation experiment using high precision GPS timing receivers N85-28299
International time transfer and portable clock evaluation using GPS timing receivers: Preliminary results N85-28303
SATELLITE TRANSMISSION
Time synchronization experiments with APPLE N85-28323
SAUDI ARABIA
Saudi Arabian refraction profile: Crustal structure of the Red Sea-Arabian Shield transition N85-28484
Saudi Arabian refraction profile: A preliminary interpretation for the Red Sea-Arabian Shield transition N85-28485
A traveltime interpretation of the 1978 seismic refraction profile in the Kingdom of Saudi Arabia N85-28486
Explanation of Russian models: Saudi Arabian seismic refraction profile N85-28487
Interpretation of the data of USGS seismic refraction profile across the Arabian Shield in western Saudi Arabia N85-28488
A preliminary analysis of the Saudi Arabian deep seismic sounding data N85-28489
One-dimensional velocity-depth functions determined for the Arabian Shield and the southwestern Red Sea: A comparison of models N85-28490
A comparison of crustal sections: Arabian Shield to the Red Sea N85-28491
SCALE EFFECT
The Shock and Vibration Digest, volume 17, no. 2
[AD-A153129] N85-28400
Recent progress in the dynamic plastic behaviour of structures, part 4 N85-28402
SCALING LAWS
Restrike particle beam experiments on a dense plasma focus. Opening switch research on a dense plasma focus
[AD-A152991] N85-28802
SCATTER PROPAGATION
A transport theory of millimeter wave propagation in woods and forests
[AD-A151883] N85-28196
SCATTERING COEFFICIENTS
Light scattering by leaf layers with application to canopy reflectance modeling: The Scattering by Arbitrarily Inclined Leaves (SAIL) model
[NLR-MP-84011-U] N85-28796
SCATTERING CROSS SECTIONS
Electromagnetic transmission through a slot in a perfectly conducting plane
[AD-A153224] N85-28210
Application of forward scattering renormalization to scattering in turbid media
[AD-A153232] N85-28271
A study of excitations during collisionally-induced electron detachment of negative ions
[AD-A152879] N85-28739
New experimental results in two photon physics
[NIKHEF-H/84-16] N85-28776
SCHEDULING
Large scale electricity production scheduling via nonlinear optimization
[REPT-84-07] N85-28655
SCHOTTKY DIODES
Completely consumed carbide: A new process for dielectric isolation
[AD-A152379] N85-27987

Research and developmental study on MIS thin film solar cells of amorphous hydrogenated silicon, part 2
[BMFT-FB-T-84-290] N85-28467

SCIENTIFIC SATELLITES
Assessment study of liquid content measurement methods applicable to space missions — Infrared Space Observatory
[TU-HH-TRI-ESA-84-2] N85-28135

SCINTILLATION
Scintillation using NNSS satellites
[AD-A152804] N85-28207

SEA ICE
An assessment of atmospheric refractivity in the northern marginal ice zone
[AD-A152346] N85-28493

SEA SURFACE TEMPERATURE
Observations of surface water temperature in the Netherlands since 1860: Statistics
[KNMI-WR-84-3] N85-28531
Observations of surface water temperature in the Netherlands since 1860: Tables for light vessels
[KNMI-WR-84-4] N85-28532
Observations of surface water temperature in the Netherlands since 1860: Series from KNMI-RWS
[KNMI-WR-84-5] N85-28533

SEA TRUTH
An assessment of the potential role of multispectral imagery in bathymetric charting
[AD-A152460] N85-28438

SEA WATER
Fatigue of synthetic fibers for marine rope applications
[MIT-R84-2] N85-28414
The effects of sea water and concentrated salt solutions on the fatigue of nylon 6,6 fibers N85-28416

SEALING
Preventing the formation of an anomalous structure in chemically sealed low carbon steel
[BLL-BISI-TRANS-22373-(9022.06)] N85-28085

SEALS (STOPPERS)
Spacer structure
[AD-D011641] N85-27866

SECONDARY RADAR
Developments in the area of air traffic control systems and the relation with meteorology
[NLR-MP-84029-U] N85-27848

SEDIMENT TRANSPORT
Modern sedimentation in the northern Barents Sea: Input, dispersal and deposition of suspended sediments from glacial meltwater
[AD-A152520] N85-28530

SEDIMENTS
Modern sedimentation in the northern Barents Sea: Input, dispersal and deposition of suspended sediments from glacial meltwater
[AD-A152520] N85-28530
Numerical benchmark study for the finite element computer code NEPTUNE
[DE85-008400] N85-28630

SEISMIC WAVES
The Shock and Vibration Digest, volume 17, no. 2
[AD-A153129] N85-28400
The effects of seismic waves N85-28401
Proceedings of the 1980 Workshop of the International Association of Seismology and Physics of the Earth's Interior on the Seismic Modeling of Laterally Varying Structures: Contributions based on data from the 1978 Saudi Arabian refraction profile
[GS-CIRC-937] N85-28476
Two-dimensional inverse kinematic problem: Application to the Saudi Arabian refraction profile N85-28478
Crustal structure of the Red Sea-Arabian Shield transition N85-28479
A seismic refraction profile across the Arabian Shield N85-28481
The rifted margin of Saudi Arabia N85-28483

SEISMOLOGY
The Shock and Vibration Digest, volume 17, no. 2
[AD-A153129] N85-28400
The effects of seismic waves N85-28401
Australian seismological report, 1980
[REPT-252] N85-28473
Proceedings of the 1980 Workshop of the International Association of Seismology and Physics of the Earth's Interior on the Seismic Modeling of Laterally Varying Structures: Contributions based on data from the 1978 Saudi Arabian refraction profile
[GS-CIRC-937] N85-28476
Preliminary interpretation of Saudi Arabian seismic refraction data N85-28477
Two-dimensional inverse kinematic problem: Application to the Saudi Arabian refraction profile N85-28478
Crustal structure of the Red Sea-Arabian Shield transition N85-28479
A crustal section for the Arabian Shield and adjacent Red Sea margin derived from first-arrival data N85-28480
A seismic refraction profile across the Arabian Shield N85-28481
A preliminary examination of the 1978 refraction profiles in Saudi Arabia N85-28482
The rifted margin of Saudi Arabia N85-28483
Saudi Arabian refraction profile: Crustal structure of the Red Sea-Arabian Shield transition N85-28484
Saudi Arabian refraction profile: A preliminary interpretation for the Red Sea-Arabian Shield transition N85-28485
A traveltime interpretation of the 1978 seismic refraction profile in the Kingdom of Saudi Arabia N85-28486
Explanation of Russian models: Saudi Arabian seismic refraction profile N85-28487
Interpretation of the data of USGS seismic refraction profile across the Arabian Shield in western Saudi Arabia N85-28488
A preliminary analysis of the Saudi Arabian deep seismic sounding data N85-28489
One-dimensional velocity-depth functions determined for the Arabian Shield and the southwestern Red Sea: A comparison of models N85-28490

SELECTIVE DISSEMINATION OF INFORMATION
Organization of scientific, technical information services N85-28873

SELECTIVE SURFACES
High-altitude testing of selective optical coatings for solar radiators and collectors N85-28143
Selective coatings for solar heat converters N85-28144

SELECTIVITY
Correlation of zeolite ZSM-5 acid strength with catalytic activity and selectivity
[DE85-005415] N85-28013
High-altitude testing of selective optical coatings for solar radiators and collectors N85-28143
Selective coatings for solar heat converters N85-28144

SELF ALIGNMENT
Simulation of gyrocompassing alignment and calibration of strapdown inertial navigation system in a swaying vehicle
[DFVLR-MITT-84-20] N85-27850

SEMANTICS
Towards a uniform topological treatment of streams and functions on streams
[CWI-CS-R8422] N85-28639

SEMICONDUCTOR LASERS
The construction and study of improved Al(x)Ga(1-x)As-GaAs heterostructure devices
[AD-A153264] N85-28244
Injection laser structure design
[AD-A153210] N85-28345

SEMICONDUCTORS (MATERIALS)
Heat pipe and method of making same
[AD-D011654] N85-28273
Laser measurement techniques: Laser spectroscopy in semiconductors
[DE85-007887] N85-28350
Optical waveguide characterization using grating couplers
[AD-A153063] N85-28789
Morphology of GaAs/sub 1-x/P/sub x/ superlattices grown by MOCVD and chloride VPE
[DE85-002944] N85-28642

SENSITIVITY
Design of SC cut 10 MHZ H.Q. crystals with G. sensitivity better than 2.10(-10)/G N85-28319

SENSORIMOTOR PERFORMANCE
M-BLASER: A device to study pursuit tracking in the rhesus monkey
[AD-A152966] N85-28534

SENSORS
Hardware test program for evaluation of baseline range/range rate sensor concept
[NASA-CR-175910] N85-28194

SEPARATED FLOW
Method of calculating separation flow of subsonic gas stream around wings N85-28161
Proceedings of the 9th US Air Force and the Federal Republic of Germany Data Exchange Agreement Meeting, Viscous and Interacting Flow Field Effects
[AD-A153020] N85-28266
Characteristics of a confined jet thrust vector control nozzle
[AD-A153087] N85-28268

SERIES (MATHEMATICS)
On the exceedance point process for a stationary sequence
[AD-A152827] N85-28665

SERIES EXPANSION
Asymptotic expansion of Jacobi polynomials
[REPT-84-35] N85-28689
Uniform asymptotic expansions of integrals
[CWI-AM-R8412] N85-28694

SERVICE LIFE
Bifunctional oxygen electrodes
[DE85-006871] N85-28248
DOE/Sandia point-focus concentrator program, draft
[DE85-008209] N85-28793

SET THEORY
A note on integral operators
[REPT-83-26] N85-28688

SHADOWGRAPH PHOTOGRAPHY
Optical system for measuring shadowgraph data
[AD-D011642] N85-28784

SHAFTS (MACHINE ELEMENTS)
Calculation of friction at spherical bearing journals in turbomachines N85-28150
Determination of wear intensity and resource of crankshafts and cylinder liners of ZIL-130 and ZMZ-53 engines
[BLL-BISI-TRANS-21393-(9022.06)] N85-28355

SHAPES
Fluid surface behavior in low gravity. Center discretionary fund no. 83-21
[NASA-TP-2486] N85-28260
Shape preserving spline interpolation N85-28564
The construction of curves and surfaces using numerical optimization techniques N85-28565
Free-form design in solid modelling N85-28569
Triangular Berstein-Bezier patches, a survey and new results N85-28577
Urn models and beta-splines N85-28580
A new technique for system-to-system transfer of surface data N85-28589

SHEAR PROPERTIES
Coherent structure reflective turbulent viscous flow modeling
[AD-A153086] N85-28267
Analytical shear buckling investigation of curved composite panels
[AD-A153138] N85-28421

SHEAR STRAIN
Elastic equilibrium of composite shells with finite shear rigidity N85-28163

SHEAR STRESS
Recent progress in the dynamic plastic behaviour of structures, part 4 N85-28402
Investigations of the material factors in the adiabatic shearing of steels
[AD-A153084] N85-28418

SHELL STABILITY
Dynamic creep buckling: Analysis of shell structures subjected to time-dependent mechanical and thermal loading N85-27959
Elastic equilibrium of composite shells with finite shear rigidity N85-28163
Stability of cylindrical shells with variable thickness under external pressure N85-28164
Initial imperfection surveys on conical shells at Hoechst AG
[VTH-LR-407] N85-28429

SHELL THEORY
Dynamic creep buckling: Analysis of shell structures subjected to time-dependent mechanical and thermal loading N85-27959
Elastic equilibrium of composite shells with finite shear rigidity N85-28163
Method of solving problems of statics for multilayer shells of revolution N85-28167

SHELLS (STRUCTURAL FORMS)
Propagation of non-axisymmetric elastic waves through shell with filler under radial load at one end N85-28169
The Mises yield condition for thin rotationally symmetric shells
[BLL-BISI-TRANS-22047-(9022.06)] N85-28409

SHIP TO SHORE COMMUNICATION
Development of a microprocessor controlled communication system for ships
[BMFT-FB-T-84-275] N85-28216

SHIPS
USSR report: Engineering and equipment
[JPRS-UEQ-85-004] N85-28142

SHOCK DISCONTINUITY
Characteristics of steady-state hypersonic flow about blunted bodies with discontinuities in generators N85-28155

SHOCK RESISTANCE
Design of SC cut 10 MHZ H.Q. crystals with G. sensitivity better than 2.10(-10)/G N85-28319

SHOCK TUBES
Investigation of heat transfer to a turbine blade cascade using a shock tube
[AD-A153090] N85-27871
Characteristics of steady-state hypersonic flow about blunted bodies with discontinuities in generators N85-28155

Impact starting of plane nozzles with wide divergence angle N85-28156

SHOCK WAVE PROPAGATION

Impact starting of plane nozzles with wide divergence angle N85-28156

Supersonic flow around blunt wedge N85-28158

Proceedings of the 1980 Workshop of the International Association of Seismology and Physics of the Earth's Interior on the Seismic Modeling of Laterally Varying Structures: Contributions based on data from the 1978 Saudi Arabian refraction profile
[GS-CIRC-937] N85-28476

Preliminary interpretation of Saudi Arabian seismic refraction data N85-28477

Two-dimensional inverse kinematic problem: Application to the Saudi Arabian refraction profile N85-28478

Crustal structure of the Red Sea-Arabian Shield transition N85-28479

A seismic refraction profile across the Arabian Shield N85-28481

A preliminary examination of the 1978 refraction profiles in Saudi Arabia N85-28482

The rifted margin of Saudi Arabia N85-28483

Solar wind observations associated with a slow forward shock wave at 0.31 AU
[MPAE-W-79-84-48] N85-28909

SHOCK WAVES

Characteristics of steady-state hypersonic flow about blunted bodies with discontinuities in generators N85-28155

Formation of a fine structure during shock wave welding
[BLL-BISI-TRANS-22401-(9022.06)] N85-28368

Australian seismological report, 1980
[REPT-252] N85-28473

SHORT TAKEOFF AIRCRAFT

Analysis of control system from a viewpoint of desired pole placement and desired degree of robustness
[AD-A152627] N85-27876

The STOL and maneuver technology program integrated control system development N85-27910

SHORT WAVE RADIATION

Solar radiance models for determination of ERBE scanner filter factor
[NASA-CR-172595] N85-28513

SIDE-LOOKING RADAR

Developments in remote sensing
[B8580069] N85-28441

SIGNAL DETECTION

Microwave responses of the western North Atlantic
[NASA-CR-175888] N85-28191

SIGNAL PROCESSING

Performance analysis of the DSN baseband assembly (Bba) Real-Time Combiner (RTC)
[NASA-CR-175878] N85-28190

Digital methods of the optimum processing of radar signals
[AD-A152469] N85-28202

Pipelined programmable charge domain device
[AD-D011598] N85-28225

Research on superconductive signal-processing devices
[AD-A152703] N85-28235

A plan for the development of inertial reconstruction of initial state clock (IRIS) N85-28317

Studies of optical-beam phase-conjugation by nonlinear refraction
[AD-A152665] N85-28788

SIGNAL REFLECTION

Kirchhoff modeling via wave equation datuming
[AD-A152399] N85-28727

SIGNAL TO NOISE RATIOS

On the probability density of signal-to-noise ratio in an improved detector
[AD-A152529] N85-28232

Experimental performance of a frequency measurement circuit
[AD-A152951] N85-28239

SILENCERS

Exhaust systems for passenger vehicles: Test procedure for resistance to internal corrosion of silencers
[BLL-BISI-TRANS-22360-(9022.06)] N85-28361

SILICATES

Influence of eutectic silicate inclusions on micro-processes during deformation and fracture of 12GS steel
[BLL-BISI-TRANS-22296-(9022.06)] N85-28073

Model for the growth of fractal silica polymers
[DE85-007884] N85-28115

SILICIDES

Thin films properties of sputtered niobium silicide on SiO2, Si3N4 and on n+ poly-Si
[AD-A152378] N85-28228

SILICON

Influence of manganese and heat treatment on structure and properties of Fe-0.1 percent-C-14 percent Cr-based steels
[BLL-BISI-TRANS-22299-(9022.06)] N85-28071

Fracture mechanics analysis of cold drawn Si-Cr valve steel
[BLL-BISI-TRANS-22216-(9022.06)] N85-28405

Comprehensive silicon solar cell computer modeling
[NASA-CR-175959] N85-28461

Research and developmental study on MIS thin film solar cells of amorphous hydrogenated silicon, part 2
[BMFT-FB-T-84-290] N85-28467

The effect of ion-bombardment-induced atomic mixing on depth-profiling of interfaces
[AD-A153199] N85-28834

SILICON CARBIDES

Reaction-bonded and fiber-reinforced SiC static and dynamic gas turbine components
[BMFT-FB-T-84-302] N85-27874

Completely consumed carbide: A new process for dielectric isolation
[AD-A152379] N85-27987

Titanium metal-matrix composites
[AD-D011643] N85-28086

Preparation of silicon carbide-silicon nitride fibers by the pyrolysis of polycarbosilazane precursors
[NASA-TM-86505] N85-28107

Development of high temperature resistant noncorrodible silicon carbide components for gas turbine applications, follow-up report
[BMFT-FB-T-85-016] N85-28126

SILICON CONTROLLED RECTIFIERS

Random access memory technologies
[AD-A153089] N85-28597

SILICON DIOXIDE

Influence of eutectic silicate inclusions on micro-processes during deformation and fracture of 12GS steel
[BLL-BISI-TRANS-22296-(9022.06)] N85-28073

Analysis of time dependent dielectric failures
[AD-A153200] N85-28243

Silica problem in the design of geothermal power plants
[DE85-008245] N85-28453

SILICON NITRIDES

Preparation of silicon carbide-silicon nitride fibers by the pyrolysis of polycarbosilazane precursors
[NASA-TM-86505] N85-28107

Development of high temperature resistant, noncorrosible, non-metallic ceramic materials, especially silicon nitride in gas turbine application
[BMFT-FB-T-85-015] N85-28125

High temperature fracture mechanics of silicon nitride
[BMFT-FB-T-84-285] N85-28433

SILICON POLYMERS

Preparation of silicon carbide-silicon nitride fibers by the pyrolysis of polycarbosilazane precursors
[NASA-TM-86505] N85-28107

SILICON TRANSISTORS

The construction and study of improved Al(x)Ga(1-x)As-GaAs heterostructure devices
[AD-A153264] N85-28244

SILICONES

Model for the growth of fractal silica polymers
[DE85-007884] N85-28115

SILOXANES

Thermally stable elastomers: Review of silarylene-siloxane polymers and polysilmethylenes
[AD-A152323] N85-28111

SILVER

The loss of material from the cathode of metal arcs
[NASA-TM-77845] N85-27985

SIMPLEX METHOD

A greedy algorithm for the transhipment along a single road problem
[AD-A152343] N85-28709

SIMULATION

The evolution of ACS for helicopters: Conceptual simulation studies to preliminary design N85-27890

Physical-chemical model for the mechanism of glass corrosion with particular consideration of simulated radioactive waste glasses
[DE85-007713] N85-28121

Conformational and mechanical properties at high strain rates
[AD-A153401] N85-28272

Study of a simulated test for assessing the machinability of steels
[BLL-BISI-TRANS-22344-(9022.06)] N85-28357

Mathematical modeling and simulation of climate and climatic change
[DE85-008974] N85-28526

Robust regression through robust covariances
[AD-A153301] N85-28677

An experimental investigation of the angular scattering and backscattering behaviors of the simulated clouds of the outer planets
[NASA-CR-175909] N85-28896

SIMULATORS

The gust simulation apparatus of the 3m x 3m low speed wind tunnel of the DFVLR in Goettingen, West Germany
[DFVLR-FB-85-04] N85-27920

SINKS

Tribological sinks: Money down the drain
[DE85-010019] N85-28376

SINTERING

Reaction-bonded and fiber-reinforced SiC static and dynamic gas turbine components
[BMFT-FB-T-84-302] N85-27874

Powder-metallurgy alloys and steels
[BLL-BISI-TRANS-22239-(9022.06)] N85-28050

Sintering and properties of metal-ceramic alloys of the Kovar type
[BLL-BISI-TRANS-21822-(9022.06)] N85-28060

Process for making electrodes for discharge tubes
[DE85-008698] N85-28247

Electrodes for flash discharge lamps
[DE85-008897] N85-28250

Effects of processing chemistry on electrical properties of high field ZnO varistors
[DE85-007688] N85-28254

SITE SELECTION

Parabolic dish test site: History and operating experience
[NASA-CR-175892] N85-28447

SIZE DISTRIBUTION

The dynamical behavior of the age-size-distribution of a cell population
[CWI-AM-R8414] N85-28538

SKIN (STRUCTURAL MEMBER)

Friction and wear behavior of aluminum and composite I-beam stiffened airplane skins
[NASA-TM-86418] N85-27852

SLEEP DEPRIVATION

Sleep deprivation and performance: Older age performance and limited sleep period use
[AD-A153102] N85-28540

SLENDER WINGS

Aerodynamic performance of a wing in ground effect using the PANAIR program
[AD-A153303] N85-27832

SLIDING

Interaction among inhomogeneities and inclusions
[AD-A153114] N85-28419

SLOTS

Electromagnetic transmission through a slot in a perfectly conducting plane
[AD-A153224] N85-28210

SLURRIES

Catalyst and reactor development for a liquid phase Fischer-Tropsch process
[DE85-005894] N85-28014

SMOKE

Evaluation of pyrotechnic fire suppression system for six pyrotechnic compositions
[AD-A152995] N85-28130

SMOKE DETECTORS

Evaluation of pyrotechnic fire suppression system for six pyrotechnic compositions
[AD-A152995] N85-28130

SNOW

Snow Scale/Rate meter
[AD-D011648] N85-28505

SNOW COVER

Precipitation and snow cover data, 1977
[ISBN-951-697-215-2] N85-28514

SOCIAL FACTORS

The effects of controversy and concurrence seeking on effective decision making
[AD-A153370] N85-28555

Social and political problems in Soviet basic research
[AD-P004565] N85-28860

SOCIOLOGY

Science and Technology in the Soviet Union
[AD-A152828] N85-28856

SOFTENING

Thermomechanical softening treatment for bearing and tool steels
[BLL-BISI-TRANS-22432-(9022.06)] N85-28035

SOFTWARE ENGINEERING

COSMIC Software Catalog, 1985 edition
[NASA-CR-174070] N85-28608

Peer Review of a Formal Verification/Design Proof Methodology
[NASA-CP-2377] N85-28609

Automatic distribution of programs in MASCOT and Ada (trademark) environments: A feasibility study
[AD-A152665] N85-28614

Implementation of a general finite element code on an IBM PC compatible microcomputer
[AD-A152881] N85-28615
A test methodology for an automated and interactive software development environment
[AD-A152857] N85-28618
CLEANROOM software development: An empirical evaluation
[AD-A152924] N85-28619
CAMAC 488 module: 68000 based GPIB interface module
[DE85-009367] N85-28635

SOFTWARE TOOLS
The interactive generation of specifications for an onboard software series (GISELE) N85-27906
COSMIC Software Catalog, 1985 edition
[NASA-CR-174070] N85-28608

SOIL MAPPING
Airphoto interpretation of vegetation and landforms for soil mapping N85-28436

SOILS
Effect of the agressive action of soil on metallic pipelines. New possibilities for the passive and active corrosion protection
[BLL-BISI-TRANS-21630-(9022.06)] N85-28070

SOLAR ARRAYS
Relative potentials of concentrating and two-axis tracking flat-plate photovoltaic arrays for central-station applications
[NASA-CR-175889] N85-28446

SOLAR BLANKETS
Solar array flight experiment
[NASA-TM-86506] N85-27935

SOLAR CELLS
Electrical research on solar cells and photovoltaic materials
[NASA-CR-175897] N85-28452
Comprehensive silicon solar cell computer modeling
[NASA-CR-175959] N85-28461
Report on high intensity solar cells
[DE85-008396] N85-28462
Terrestrial photovoltaic power systems with sunlight concentration
[DE85-008398] N85-28464
Research and developmental study on MIS thin film solar cells of amorphous hydrogenated silicon, part 2
[BMFT-FB-T-84-290] N85-28467

SOLAR COLLECTORS
High-altitude testing of selective optical coatings for solar radiators and collectors N85-28143
Selective coatings for solar heat converters N85-28144
Relative potentials of concentrating and two-axis tracking flat-plate photovoltaic arrays for central-station applications
[NASA-CR-175889] N85-28446
Parabolic dish test site: History and operating experience
[NASA-CR-175892] N85-28447
A program for the calculation of paraboloidal-dish solar thermal power plant performance
[NASA-CR-175874] N85-28449
Development of mass-producible line-focus tracking concentrating solar collectors. Category 2: Control systems
[DE85-007873] N85-28459
Shenandoah parabolic dish solar collector
[DE85-008326] N85-28460
DOE/Sandia point-focus concentrator program, draft
[DE85-008209] N85-28793

SOLAR COOLING
Experiments on sorption characteristics of solid desiccant materials for solar desiccant cooling systems
[DE85-000542] N85-28019

SOLAR CORONA
The solar coronal X-ray spectrum 5.5-12 A
[AD-A152334] N85-28908

SOLAR ENERGY ABSORBERS
Selective coatings for solar heat converters N85-28144

SOLAR ENERGY CONVERSION
Alternative heat sources for heat pumps
[DE85-007610] N85-28275
Activity and accomplishments of dish/Stirling electric power system development
[NASA-CR-175841] N85-28445
Parabolic dish test site: History and operating experience
[NASA-CR-175892] N85-28447
A program for the calculation of paraboloidal-dish solar thermal power plant performance
[NASA-CR-175874] N85-28449

SOLAR FLARES
Electron-cyclotron maser emission during solar and stellar flares
[NASA-CR-175883] N85-28907

SOLAR FLUX
Forecast verification of the 10.7 centimeter solar flux and the Ap daily geomagnetic activity indices
[AD-A152959] N85-28499

SOLAR GENERATORS
Parabolic dish test site: History and operating experience
[NASA-CR-175892] N85-28447

SOLAR GRANULATION
Activities report of the Institute of Astronomy and Astrophysics N85-28891
Activities report of the Institute of Astronomy and Astrophysics N85-28892

SOLAR HEATING
Development of mass-producible line-focus tracking concentrating solar collectors. Category 2: Control systems
[DE85-007873] N85-28459

SOLAR OSCILLATIONS
Activities report of the Institute of Astronomy and Astrophysics N85-28891
Activities report of the Institute of Astronomy and Astrophysics N85-28892

SOLAR RADIATION
Solar radiance models for determination of ERBE scanner filter factor
[NASA-CR-172595] N85-28513

SOLAR SAILS
Maximizing the semi-major axis for a freely coning solar sailcraft
[AD-A153175] N85-27938

SOLAR SPECTRA
Activities report of the Institute of Astronomy and Astrophysics N85-28892
The solar coronal X-ray spectrum 5.5-12 A
[AD-A152334] N85-28908

SOLAR SYSTEM
The study of the physics of cometary nuclei
[NASA-CR-175917] N85-28905

SOLAR TOTAL ENERGY SYSTEMS
Shenandoah parabolic dish solar collector
[DE85-008326] N85-28460

SOLAR WIND
Supersonic flow around weak radiation sources N85-28162
Solar wind observations associated with a slow forward shock wave at 0.31 AU
[MPAE-W-79-84-46] N85-28909

SOLAR X-RAYS
The solar coronal X-ray spectrum 5.5-12 A
[AD-A152334] N85-28908

SOLDERING
Printed wiring board circuit isolator tool
[AD-D011638] N85-28333

SOLENOIDS
Effect of superconducting solenoid model cores on spanwise iron magnet roll control
[NASA-TM-86378] N85-27915
Optimum dimensions of power solenoids for magnetic suspension
[NASA-TM-77864] N85-28716

SOLID PHASES
X-ray diffraction study of changes in stress-strain distributions during fatigue of a 2-phase alloy
[AD-A152367] N85-28087

SOLID PROPELLANT ROCKET ENGINES
Surveillance report. Stage 1: Dissected motors-propellants motor number 0012199, phase 15
[AD-A153206] N85-27973
MM2 LRSLA testing stage 3 propellant
[AD-A152540] N85-28128

SOLID ROCKET PROPELLANTS
Surveillance report. Stage 1: Dissected motors-propellants motor number 0012199, phase 15
[AD-A153206] N85-27973

SOLID STATE DEVICES
Technology development for thin-film-trace humidity sensors
[BMFT-FB-T-84-268] N85-28338

SOLID SURFACES
Theory of laser-stimulated surface process. 2: A generalized-master-equation approach to energy transfer between an IR laser, an aspectles and phonons
[AD-A153083] N85-28344

SOLIDIFICATION
Use of principle of local equilibrium for assessing diffusional supersaturation during solidification of alloys
[BLL-BISI-TRANS-22487-(9022.06)] N85-28077

SOLIDS
Experiments on sorption characteristics of solid desiccant materials for solar desiccant cooling systems
[DE85-000542] N85-28019
Free-form design in solid modelling N85-28569
Boundary to constructive solid geometry mapings: A focus on 2-D issues N85-28570
A unified representation scheme for solid geometric objects using B-splines (extended abstract) N85-28585

SOLITARY WAVES
Coherent state description of non-topological solitons and momentum projection
[DE85-007814] N85-28761

SOLUTION
Electrochemistry of polymer films not immersed in solution: Electron transfer on an ion budget
[AD-A152969] N85-27998

SOLVENTS
Investigation of the structure and dynamics of electrolytes in solvents used for primary and secondary Li-batteries
[AD-A153099] N85-28240

SOOT
An investigation into the soot production processes in a gas turbine engine
[AD-A152710] N85-27992

SORPTION
Experiments on sorption characteristics of solid desiccant materials for solar desiccant cooling systems
[DE85-000542] N85-28019

SOUND INTENSITY
The Shock and Vibration Digest, volume 17, no. 1
[AD-A151051] N85-28397
Sound intensity measurement N85-28398

SOUND PROPAGATION
The Shock and Vibration Digest, volume 17, no. 1
[AD-A151051] N85-28397
Sound intensity measurement N85-28398
Numerical evaluation of low frequency sound propagation in layered media
[AD-A152690] N85-28728

SOUND TRANSDUCERS
Acoustooptic pulse-echo transducer system
[NASA-CR-175919] N85-28224
The Shock and Vibration Digest, volume 17, no. 1
[AD-A151051] N85-28397
Sound intensity measurement N85-28398

SOUND TRANSMISSION
Mobile television radio link
[AD-A152381] N85-28201
Sound intensity measurement N85-28398
Numerical evaluation of low frequency sound propagation in layered media
[AD-A152690] N85-28728

SPACE BASED RADAR
Primary propulsion of electrothermal, ion and chemical systems for space-based radar orbit transfer
[NASA-TM-87043] N85-27972

SPACE CHARGE
The design of megawatt gyrotrons
[DE85-007892] N85-28754

SPACE COLONIES
Historical perspective on the Moon base: The British perspective
[DE85-005905] N85-27925

SPACE COMMERCIALIZATION
The Ariane launch vehicle is the key of the Europeans to the space market N85-27931

SPACE ERECTABLE STRUCTURES
Deployable controllable geometry truss beam
[NASA-TM-86366] N85-27934
Solar array flight experiment
[NASA-TM-86506] N85-27935

SPACE LABORATORIES
Documentation for the West German Federal Cabinet's space policy decision N85-28886

SPACE LOGISTICS
In orbit infrastructure. Volume 1: Executive summary — European space programs
[RX011-002/84-VOL-1] N85-27928

SPACE MAINTENANCE
In orbit infrastructure. Volume 1: Executive summary — European space programs
[RX011-002/84-VOL-1] N85-27928

SPACE SHUTTLE MAIN ENGINE
Structural Integrity and Durability of Reusable Space Propulsion Systems
[NASA-CP-2381] N85-27941
Overview of aerothermodynamic loads definition study N85-27942
SSME fuel preburner two-dimensional analysis N85-27943
SSME turbopump turbine computations N85-27944
Simulation of multistage turbine flows N85-27945
New facility to study unsteady wake effects on turbine airfoil heat transfer N85-27948
Calculation of viscous compressible flows in small gas turbines N85-27950
Flow-induced vibration of SSME main injector liquid-oxygen posts N85-27951
Overview of structural response: Probabilistic structural analysis N85-27952

Composite loads spectra for select space propulsion structural components N85-27953
Probabilistic structural analysis of SSME turbopump blades: Probabilistic geometry effects N85-27958
Structural tailoring of SSME blades (vanes) N85-27960
Cyclic structural analyses of SSME turbine blades N85-27963
Effects of high mean stress on high-cycle fatigue behavior of PWA 1480 N85-27964
Constitutive cyclic deformation behavior in single-crystal and directionally solidified SSME high-pressure fuel turbopump airfoil materials N85-27965
Thin-film sensors for space propulsion technology N85-27968
Optical strain measurement system development N85-27969
Heat flux sensor calibrator N85-27970
Feasibility of mapping velocity flow fields in SSME powerhead by laser anemometry techniques N85-27971
Analysis of physical-chemical processes governing SSME internal fluid flows [NASA-CR-175893] N85-28261

SPACE SHUTTLE MISSION 41-B
Results from radiation monitoring equipment experiment on STS-11 [AD-A152531] N85-27932

SPACE SHUTTLE ORBITERS
Active control technology experience with the Space Shuttle in the landing regime N85-27900
Shuttle-tethered satellite system definition study. Volume 1: Executive study [NASA-CR-171474] N85-27924

SPACE SHUTTLES
Shuttle-tethered satellite system definition study extension [NASA-CR-171473] N85-27923
Results from radiation monitoring equipment experiment on STS-11 [AD-A152531] N85-27932
Mathematical modeling and control of a large space structure as applied to a shuttle-antenna configuration [AD-A153269] N85-27939
Analysis of heat-transfer measurements from 2 AEDC wind tunnels on the Shuttle external tank [NASA-CR-171470] N85-28263
Heating parameter estimation using coaxial thermocouple gages in wind tunnel test articles [AD-A153039] N85-28328

SPACE STATIONS
Space Station crew safety alternatives study. Volume 5: Space Station safety plan [NASA-CR-3858] N85-27930
Automation and robotics for the National Space Program [NASA-CR-175881] N85-27936
Performance analysis of radiation cooled dc transmission lines for high power space systems [NASA-TM-87040] N85-28222
Documentation for the West German Federal Cabinet's space policy decision N85-28886

SPACEBORNE ASTRONOMY
IRAS: Space technology from the Netherlands [B85101841] N85-27929
Assessment study of liquid content measurement methods applicable to space missions --- Infrared Space Observatory [TU-HH-TRI-ESA-84-2] N85-28135

SPACEBORNE EXPERIMENTS
Botany facility phase A study. Core payload number 6 EURECA carrier, volume 1 [ESA-CR(P)-1978-VOL-1] N85-27918
Botany facility phase A study. Core payload number 6 for EURECA carrier, volume 2 [BF-TD-DRD-03-VOL-2] N85-27919
Long life feasibility study for the shuttle infrared telescope facility [NASA-CR-3722] N85-28893

SPACEBORNE TELESCOPES
Long life feasibility study for the shuttle infrared telescope facility [NASA-CR-3722] N85-28893

SPACECRAFT COMMUNICATION
Water vapor radiometry research and development phase [NASA-CR-175887] N85-28512

SPACECRAFT COMPONENTS
The GfW handbook for data compilation of irradiation tested electronic components, volume 3 [HMI-B-353-VOL-3] N85-28258

SPACECRAFT CONFIGURATIONS
Incorporating control into the optimal structural design of large flexible space structures [AD-A152858] N85-27937

SPACECRAFT INSTRUMENTS
Cosmic X-ray physics [NASA-CR-175908] N85-28910

SPACECRAFT LAUNCHING
Structure of SYLDA double launch system for Ariane N85-28185

SPACECRAFT POWER SUPPLIES
Performance analysis of radiation cooled dc transmission lines for high power space systems [NASA-TM-87040] N85-28222

SPACECRAFT PROPULSION
Structural integrity and Durability of Reusable Space Propulsion Systems [NASA-CP-2381] N85-27941
Composite loads spectra for select space propulsion structural components: Probabilistic load model development N85-27954
Probabilistic structural analysis theory development N85-27955
Probabilistic finite element development N85-27956
Thin-film sensors for space propulsion technology N85-27968

SPACECRAFT STRUCTURES
Structure of SYLDA double launch system for Ariane N85-28185

SPACECRAFT TRACKING
Water vapor radiometry research and development phase [NASA-CR-175887] N85-28512

SPACECREWS
Results from radiation monitoring equipment experiment on STS-11 [AD-A152531] N85-27932

SPACELAB PAYLOADS
Long life feasibility study for the shuttle infrared telescope facility [NASA-CR-3722] N85-28893

SPACERS
Spacer structure [AD-D011641] N85-27866

SPARK GAPS
Spark gap electrode erosion [AD-A152802] N85-28237

SPARK IGNITION
Photochemical ignition studies. 1: Laser ignition of flowing premixed gases [AD-A153048] N85-28002

SPATIAL DISTRIBUTION
Spatial light modulator having a capacitively coupled photoconductor [AD-D011646] N85-28790
Cometary atmospheres: Modeling the spatial distribution of observed neutral radicals [NASA-CR-175882] N85-28904

SPATIAL FILTERING
Jinc-trap resonator [AD-D011650] N85-28339

SPATIAL RESOLUTION
Looking at more than three dimensions [DE85-007764] N85-28600

SPECIFICATIONS
Avionics data base [AD-A152415] N85-27863
The interactive generation of specifications for an onboard software series (GISELE) N85-27906
Steel Tubes [BLL-BISI-TRANS-22064-(9022.06)] N85-28369

SPECTRAL EMISSION
X-ray emission and the winds of cataclysmic variables [DE85-007663] N85-28902

SPECTRAL METHODS
Kolmogorov and scalar spectral regimes in numerical turbulence [NASA-TM-86699] N85-28264

SPECTROSCOPY
An investigation of molecular structure of copolymers using positron annihilation spectroscopy [NASA-TM-86431] N85-27977
The spectroscopy and reaction kinetics of coordinated unsaturated metal carbonyls [AD-A153079] N85-28003
East Europe report: Science and technology [JPRS-ESA-85-017] N85-28177

SPEECH RECOGNITION
Wideband integrated voice/data technology [AD-A152329] N85-28197
A study of error rates in voice recognition [AD-A153262] N85-28211

SPHERES
A counterpart of Faxen's formula in potential flow [REPT-84-09] N85-28279

SPHERICAL SHELLS
Natural vibrations of reinforced spherical shells N85-28165

SPIN
Spin distributions in heavy ion fusion at and below the Coulomb barrier [DE85-007817] N85-28751

SPIN DYNAMICS
Use of quaternions in flight mechanics [AD-A152616] N85-27875
Lattice actions improved by block-spin renormalisation group and maximally symmetric lattices [DE85-007416] N85-28841

SPINEL
Oxygen evolution on NiCo2O4 electrodes N85-28026

SPLINE FUNCTIONS
Shape preserving spline interpolation N85-28564
Multivariate spline algorithms for CAGD N85-28566
Examination of the circle spline routine N85-28573
Convex interpolating splines of arbitrary degree N85-28574
A natural bias approach to cardinal spline curves N85-28575
An intuitive approach to geometric continuity for parametric curves and surfaces (extended abstract) N85-28579
Urn models and beta-splines N85-28580

SPLINES
The definition and computation of a metric on plane curves. The meaning of a face on a geometric model N85-28571
Spline curves, wire frames and B-value N85-28587

SPLITTING
Fracture mechanics analysis of cold drawn Si-Cr valve steel [BLL-BISI-TRANS-22216-(9022.06)] N85-28405

SPRAYED COATINGS
Erosion of corrosion-resistant surface treatments on alloy steels [DE85-008446] N85-28100

SPREAD SPECTRUM TRANSMISSION
Measured noise performance of a new method of frequency hopping [AD-A152679] N85-28234

SPUTTERING
Obtaining amorphous coatings of FeW and Fe-Cr-P-B alloys using laser sputtering [BLL-BISI-22493-(9022.06)] N85-28057

SPUTTERING GAGES
Thin-film sensors for space propulsion technology N85-27968

STABILITY
A closed loop analysis of POGO instability [AD-A153121] N85-28132
Fluid surface behavior in low gravity. Center discretionary fund no. 83-21 [NASA-TP-2486] N85-28260
Instabilities and chaotic behavior of active and passive laser systems [AD-A153366] N85-28346
How a swing behaves [DE85-008280] N85-28720
Stability in dynamical systems [DE85-006698] N85-28766
Morphological stability and fluid dynamics of vapor crystal growth [NASA-CR-175879] N85-28822
Morphological stability and fluid dynamics of vapor crystal growth [NASA-CR-175880] N85-28823

STABILIZATION
Mechanical stabilization of austenite against epsilon martensite and its effect on deformation behavior in high manganese steels [DE85-007654] N85-28097
Stabilizing force feedback in bio-actuated control systems [AD-D011634] N85-28560
Stability of high energy particle plasmas to MHD-like modes [DE85-007879] N85-28803

STAINLESS STEELS
Thermomechanical treatment aimed at the protection of type 316 stainless steel from IGC and IGSCC [BLL-BISI-TRANS-22498-(9022.06)] N85-28040
Effect of texture in steel on the susceptibility of hydrogen embrittlement [BLL-BISI-TRANS-22026-(9022.06)] N85-28048
Metallurgical means of preventing the corrosion of metal [BLL-BISI-TRANS-22320-(9022.06)] N85-28082
Properties of nitrogen containing stainless alloy designed for high resistance to pitting [DE85-008282] N85-28095
Experimental and theoretical studies on transport processes in laser welding [DE84-008572] N85-28378

STAMPING
New method for determining stampability of sheet materials
[BLL-BISI-22486-(9022.06)] N85-28360
STANDARDIZATION
High temperature position sensors based on monolithic GaAs Hall IC
[BMFT-FB-T-84-266] N85-28337
STANDARDS
Development of new circuit symbols for binary logic elements
[MBB-Z-39/85-O] N85-28640
STATIC DEFORMATION
Liquid-metal transducers for strain measurement during in-pile materials testing N85-28176
STATIC STABILITY
Demonstration of relaxed static stability on a commercial transport N85-27898
Realisation of relaxed static stability on a commercial transport N85-27899
STATICS
Numerical solution of one-dimensional nonlinear problems of statics for elastic beams and shells under rigid constraints N85-28166
Method of solving problems of statics for multilayer shells of revolution N85-28167
STATISTICAL ANALYSIS
The effect of microalloying with calcium and magnesium on the plasticity of Poldi AKN 20 Ni-based alloy
[BLL-BISI-TRANS-2174-(9022.06)] N85-28075
Computing environments for data analysis. Part 1: Introduction
[DE85-007919] N85-28603
Computing environments for data analysis. Part 2: Hardware
[DE85-008320] N85-28604
Computer program for prediction of capture maneuver probability for an on-off reaction controlled upper stage
[NASA-CR-165937] N85-28611
Software environment for conducting interactive statistical analysis
[AD-A153378] N85-28626
STATISTICAL DISTRIBUTIONS
Inequalities for distributions with increasing failure rate
[AD-A152812] N85-28390
Statistical interpretation of the ECMWF model using MOS to predict surface wind and temperature
[WSR-2] N85-28515
Estimating random integrals from noisy observations: Sampling designs and their performance
[AD-A152926] N85-28702
A collection of probability distributions
[AD-A153128] N85-28704
STATISTICAL TESTS
An empirical comparison of the accuracy of univariate and multivariate corrections for range restriction
[AD-A153071] N85-28670
A collection of probability distributions
[AD-A153128] N85-28704
STATORS
Spacer structure
[AD-D011641] N85-27866
STEADY FLOW
Upwind-difference methods for aerodynamic problems governed by the Euler equations
[REPT-84-23] N85-27834
Method of calculating separation flow of subsonic gas stream around wings N85-28161
Steady, incompressible, inviscid flow through a finite collapsible tube under longitudinal tension
[REPT-84-01] N85-28278
STEADY STATE
Luminescence probe studies of ionomers. I: Steady-state measurements from nafion membrane
[AD-A152475] N85-28730
STEEL STRUCTURES
Effects of the phase compositions of cast low-pearlite steels micro-alloyed with vanadium and titanium of their structure and properties
[BLL-BISI-TRANS-22301-(9022.06)] N85-28067
Initial imperfection surveys on conical shells at Hoechst AG
[VTH-LR-407] N85-28429
STEELS
Weldability of micro-alloy steels as reaction of structure and inclusions
[BLL-BISI-TRANS-22196-(9022.06)] N85-28027
Physio-chemical mechanisms of the processes of the formation of globular inclusions in ball-bearing metal
[BLL-BISI-TRANS-22235-(9022.06)] N85-28030
Forming of coating protection system: Mechanism of paint-coating anti-corrosion protection of steel
[BLL-BISI-TRANS-22081-(9022.06)] N85-28033
Corrosion characteristics of some steels produced through a self-cleaning rotating electrode
[BLL-BISI-TRANS-22046-(9022.06)] N85-28034
Thermomechanical softening treatment for bearing and tool steels
[BLL-BISI-TRANS-22432-(9022.06)] N85-28035
X-ray crystallography of steel U8 after pulsed laser hardening
[BLL-BISI-22444-(9022.06)] N85-28038
Steels with improved machinability
[BLL-BISI-22341-(9022.06)] N85-28061
Textural transformations taking place during heat and mechanical treatment in triplex steels
[BLL-BISI-TRANS-22404-(9022.06)] N85-28063
Microstructure and mechanical properties of rare-earths-microalloyed high-speed tool steel
[BLL-BISI-TRANS-22043-(9022.06)] N85-28064
Physical properties of steels and their temperature dependence
[BLL-BISI-TRANS-22265-(9022.06)] N85-28065
Study on mechanism of surface deformation induced by stress corrosion cracking
[BLL-BISI-TRANS-21896-(9022.06)] N85-28066
Influence of structural state and alloy content of austenite on formation of martensitic phases in steels
[BLL-BISI-TRANS-22385-(9022.06)] N85-28068
Effect of the agressive action of soil on metallic pipelines. New possibilities for the passive and active corrosion protection
[BLL-BISI-TRANS-21630-(9022.06)] N85-28070
Influence of manganese and heat treatment on structure and properties of Fe-0.1 percent-C-14 percent Cr-based steels
[BLL-BISI-TRANS-22299-(9022.06)] N85-28071
Part played by non-metallic inclusions during deformation and fracture of steel with different grain sizes
[BLL-BISI-TRANS-22321-(9022.06)] N85-28072
Influence of eutectic silicate inclusions on micro-processes during deformation and fracture of 12GS steel
[BLL-BISI-TRANS-22296-(9022.06)] N85-28073
Examination of steels by chemical analysis for quality assurance
[BLL-BISI-TRANS-22068-(9022.06)] N85-28074
Influence of preliminary thermomechanical treatment on depth and hardness of nitrided layers
[BLL-BISI-TRANS-22488-(9022.06)] N85-28078
Mechanical stabilization of austenite against epsilon martensite and its effect on deformation behavior in high manganese steels
[DE85-007654] N85-28097
Temperature and manganese content dependences of tensile deformation in iron-high manganese binary alloys
[DE85-007656] N85-28098
Hydrogen degradation of pipeline steels
[DE85-008930] N85-28101
Welding of 11 458.1 steel in shielding atmospheres
[BLL-BISI-TRANS-21763-(9022.06)] N85-28353
Submerged arc welding of new Czechoslovak micro-alloy steels
[BLL-BISI-TRANS-22193-(9022.06)] N85-28356
Application of 4-wire submerged arc method to welding UOE pipe
[BLL-BISI-TRANS-22417-(9022.06)] N85-28358
Examples of application of machinability tests
[BLL-BISI-TRANS-22346-(9022.06)] N85-28363
Assessing the machinability of gearwheel steels during manufacture
[BLL-BISI-TRANS-22343-(9902.06)] N85-28365
Steel Tubes
[BLL-BISI-TRANS-22064-(9022.06)] N85-28369
Quality testing to the specifications of the Stahl-Eisen-Pruefblatt 1570/71 using an automatic image analysis system
[BLL-BISI-TRANS-22253-(9022.06)] N85-28385
Tests of low-cycle fatigue of elected steels of class 11
[BLL-BISI-TRANS-22039-(9022.06)] N85-28404
On validity of threshold values of fatigue strength of steel structures
[BLL-BISI-TRANS-22192-(9022.06)] N85-28408
Investigations of the material factors in the adiabatic shearing of steels
[AD-A153084] N85-28418
Critical conditions for failure in materials subjected to high rates of loading
[AD-A153135] N85-28420
World iron ore reserves
[BLL-BISI-TRANS-22280-(9022.06)] N85-28435
STELLAR MODELS
Activities report of the Institute of Astronomy and Astrophysics N85-28892
STELLAR SPECTRA
Activities report of the Institute of Astronomy and Astrophysics N85-28892
STELLAR SPECTROPHOTOMETRY
Activities report of the Institute of Astronomy and Astrophysics N85-28891
Activities report of the Institute of Astronomy and Astrophysics N85-28892
STELLAR STRUCTURE
Activities report of the Institute of Astronomy and Astrophysics N85-28891
STELLAR WINDS
X-ray emission and the winds of cataclysmic variables
[DE85-007663] N85-28902
STELLARATORS
I. F. S. (Institute for Fusion Studies) Newsletter, Volume 4, Number 1
[DE85-007917] N85-28809
STELLITE (TRADEMARK)
Interaction of high-cycle and low-cycle fatigue of Haynes 188 alloy at 1400 F deg N85-27961
STIFFNESS
Friction and wear behavior of aluminum and composite I-beam stiffened airplane skins
[NASA-TM-86418] N85-27852
STIRLING CYCLE
Activity and accomplishments of dish/Stirling electric power system development
[NASA-CR-175841] N85-28445
Simplified analysis of Stirling engines and heat pumps
[DE85-008753] N85-28457
Report to Congress on the Automotive Technology Development Program
[DE85-005640] N85-28890
STOCHASTIC PROCESSES
Probabilistic finite element development N85-27956
On the exceedance point process for a stationary sequence
[AD-A152827] N85-28685
Extension of three theorems of Fourier series on the disc to the torus
[AD-A153017] N85-28689
On stochastic integral representation of stable processes with sample paths in Banach spaces
[AD-A152927] N85-28703
Maximum flow in planar networks with exponentially distributed arc capacities
[AD-A153158] N85-28710
I. F. S. (Institute for Fusion Studies) Newsletter, Volume 4, Number 1
[DE85-007917] N85-28809
STOICHIOMETRY
Study of self-propagating condensed phase reactions TiB(2) synthesis
[AD-A153198] N85-28006
New examples of clusters, extended metal-metal bonding and interstital derivatives
[DE85-005926] N85-28837
STOKES FLOW
A counterpart of Faxen's formula in potential flow
[REPT-84-09] N85-28279
STORABLE PROPELLANTS
Surveillance report. Stage 1: Dissected motors-propellants motor number 0012199, phase 15
[AD-A153206] N85-27973
STORAGE STABILITY
Surveillance report. Stage 1: Dissected motors-propellants motor number 0012199, phase 15
[AD-A153206] N85-27973
STORMS
Centralized Storm Information System (CSIS)
[NASA-CR-175898] N85-28506
A report from the Space Science and Engineering Center, the University of Wisconsin-Madison, Madison, Wisconsin N85-28507
Test and evaluation plan for the Centralized Storm Information System N85-28508
CSIS test and evaluation N85-28509
Functional and performance requirements of the next NOAA-Kasas City computer system N85-28510
Convective storm downdraft outflows detected by NASA/MSFC's Airborne 10.6 micron pulsed Doppler Lidar System
[NASA-CR-3898] N85-28511
STRAIN GAGES
Optical strain measurement system development N85-27969
Liquid-metal transducers for strain measurement during in-pile materials testing N85-28176
STRAIN MEASUREMENT
Liquid-metal transducers for strain measurement during in-pile materials testing N85-28176
Fatigue strength of Inconel 625 plate and weldments used in the DIII-D configuration vacuum vessel
[DE85-008276] N85-28427
STRAIN RATE
Conformational and mechanical properties at high strain rates
[AD-A153401] N85-28272

STRAPDOWN INERTIAL GUIDANCE
Simulation of gyrocompassing alignment and calibration of strapdown inertial navigation system in a swaying vehicle
[DFVLR-MITT-84-20] N85-27850
STRATIFICATION
The effect of the Benthic Boundary Layer on the physics of intense mesoscale eddies
[AD-A153193] N85-28270
STRATIFIED FLOW
Buildup of oscillation of bodies in stratified fluid N85-28157
STREAK PHOTOGRAPHY
Streak tube characterization
[DE85-009874] N85-28255
STREAMS
Towards a uniform topological treatment of streams and functions on streams
[CWI-CS-R8422] N85-28639
STRESS ANALYSIS
Effects of high mean stress on high-cycle fatigue behavior of PWA 1480 N85-27964
First passage times for combinations of random loads
[AD-A153275] N85-28423
STRESS CONCENTRATION
An X-ray diffraction study of the residual stress-strain distribution in shot-peened 2-phase brass
[AD-A152418] N85-28088
Natural vibrations of reinforced spherical shells N85-28165
Cyclic torsion of a circular cylinder and its residual stress distribution
[AD-A153347] N85-28424
STRESS CORROSION CRACKING
Corrosion characteristics of some steels produced through a self-cleaning rotating electrode
[BLL-BISI-TRANS-22046-(9022.06)] N85-28034
The synergistic actions of stress corrosion cracking and corrosion fatigue
[BLL-BISI-TRANS-22334-(9022.06)] N85-28045
Study on mechanism of surface deformation induced by stress corrosion cracking
[BLL-BISI-TRANS-21896-(9022.06)] N85-28066
STRESS INTENSITY FACTORS
Study to optimize Cr-Mo steels to resist hydrogen and temper embrittlement
[DE85-005492] N85-28096
STRESS RELAXATION
MM2 LRSLA testing stage 3 propellant
[AD-A152540] N85-28128
STRESS RELIEVING
Local heat treatment of welded joints of pipes and rotary vessels N85-28028
Welding of 11 458.1 steel in shielding atmospheres
[BLL-BISI-TRANS-21763-(9022.06)] N85-28353
STRESS-STRAIN RELATIONSHIPS
Cyclic structural analyses of SSME turbine blades N85-27963
X-ray diffraction study of changes in stress-strain distributions during fatigue of a 2-phase alloy
[AD-A152367] N85-28087
An X-ray diffraction study of the residual stress-strain distribution in shot-peened 2-phase brass
[AD-A152418] N85-28088
State of stress and penetration of plastic deformation in forming
[BLL-BISI-22199-(9022.06)] N85-28396
Cyclic torsion of a circular cylinder and its residual stress distribution
[AD-A153347] N85-28424
STRIP TRANSMISSION LINES
Research on superconductive signal-processing devices
[AD-A152703] N85-28235
STRONG INTERACTIONS (FIELD THEORY)
Experimental studies of diffractive phenomena
[DE85-006812] N85-28749
STRUCTURAL ANALYSIS
USAF damage tolerant design handbook: Guidelines for the analysis and design of damage tolerant aircraft structures, revision B
[AD-A153161] N85-27858
Probabilistic structural analysis theory development N85-27955
Probabilistic finite element: Variational theory N85-27957
Probabilistic structural analysis of SSME turbopump blades: Probabilistic geometry effects N85-27958
Cyclic structural analyses of SSME turbine blades N85-27963
Coherent structure reflective turbulent viscous flow modeling
[AD-A153086] N85-28267
The Shock and Vibration Digest, volume 17, no. 1
[AD-A151051] N85-28397
Continuum modeling of latticed structures N85-28399
First passage times for combinations of random loads
[AD-A153275] N85-28423
Structural analysis of terrane accretions in the eastern Brooks Range and adjacent areas in central Alaska and Canada
[DE85-008279] N85-28501
Implementation of a general finite element code on an IBM PC compatible microcomputer
[AD-A152681] N85-28615
Sample problems for STAGSC-1
[AD-A153142] N85-28621
STRUCTURAL BASINS
Tidal rectification in lateral viscous boundary layers of a semienclosed basin
[CWI-AM-R8415] N85-28284
STRUCTURAL DESIGN
Design and construction of a CW ND:YAG laser using a single elliptical cavity and water cooled krypton arc lamp pumping
[AD-A152657] N85-28340
Engineering significance of fatigue thresholds and short fatigue cracks for structural design
[NLR-MP-84001-U] N85-28430
STRUCTURAL DESIGN CRITERIA
Deployable controllable geometry truss beam
[NASA-TM-86366] N85-27934
Overview of structural response: Probabilistic structural analysis N85-27952
A ten channel temperature controller
[AD-A152664] N85-28326
Frangibility of obstacles at airports
[NLR-MP-84002-U] N85-28431
STRUCTURAL ENGINEERING
Incorporating control into the optimal structural design of large flexible space structures
[AD-A152858] N85-27937
STRUCTURAL PROPERTIES (GEOLOGY)
The Shock and Vibration Digest, volume 17, no. 2
[AD-A153129] N85-28400
The effects of seismic waves N85-28401
Yearbook of the Bureau of Mineral Resources, Geology and Physics: Geoscientific research, resource assessment, and database development, 1 Jul. 1983 to 30 Jun. 1984
[BMR-84] N85-28474
Proceedings of the 1980 Workshop of the International Association of Seismology and Physics of the Earth's Interior on the Seismic Modeling of Laterally Varying Structures: Contributions based on data from the 1978 Saudi Arabian refraction profile
[GS-CIRC-937] N85-28476
Preliminary interpretation of Saudi Arabian seismic refraction data N85-28477
Explanation of Russian models: Saudi Arabian seismic refraction profile N85-28487
STRUCTURAL RELIABILITY
Overview of structural response: Probabilistic structural analysis N85-27952
STRUCTURAL STABILITY
Injection laser structure design
[AD-A153210] N85-28345
The Shock and Vibration Digest, volume 17, no. 1
[AD-A151051] N85-28397
Continuum modeling of latticed structures N85-28399
The Shock and Vibration Digest, volume 17, no. 2
[AD-A153129] N85-28400
Recent progress in the dynamic plastic behaviour of structures, part 4 N85-28402
STRUCTURAL STRAIN
Recent progress in the dynamic plastic behaviour of structures, part 4 N85-28402
STRUCTURAL VIBRATION
On the wind-induced vibrations of a mass-spring system
[REPT-84-04] N85-28428
STUDENTS
The impact of group processing on achievement in cooperative learning groups
[AD-A153168] N85-28551
Oral discussion, group-to-individual transfer and achievement in cooperative learning groups
[AD-A153209] N85-28552
Summer High School Apprenticeship Research Program (SHARP) of the National Aeronautics and Space Administration
[NASA-CR-175791] N85-28849
SUBJECTS
Energy data base: Subject categories and scope
[DE84-017376] N85-28881
SUBSONIC FLOW
Static and dynamic pressure measurements on a NACA 0012 airfoil in the Ames High Reynolds Number Facility
[NASA-TP-2485] N85-27823
Propulsion efficiency of vibrating bodies in subsonic gas stream N85-28159
Method of calculating separation flow of subsonic gas stream around wings N85-28161
Supersonic flow around weak radiation sources N85-28162
SUBSONIC SPEED
Analysis of unsteady pressure measurements on a supercritical airfoil with a harmonically oscillating trailing edge flap at subsonic and transonic speeds
[DFVLR-FB-84-49] N85-27837
SUBSTRATES
Glassy metals: New highly resistant material
[BLL-BISI-TRANS-21764-(9022.06)] N85-28049
Properties of chromate coatings formed on electrolytic zinc substrates
[BLL-BISI-TRANS-22349-(9022.06)] N85-28052
SULFIDES
Quality testing to the specifications of the Stahl-Eisen-Pruefblatt 1570/71 using an automatic image analysis system
[BLL-BISI-TRANS-22253-(9022.06)] N85-28385
SULFONES
Polyaromatic ether-sulfone-keytones with fluoro-substituted-p-cyclophane units as cross-linking sites
[AD-D011649] N85-28105
SULFUR
Systematic nomenclature of the nitrogen, oxygen and sulfur functional polycyclic aromatic hydrocarbons
[DE85-007426] N85-27974
Gas phase ion-molecule chemistry of carbon, nitrogen and oxygen compounds
[AD-A152876] N85-27996
Part played by non-metallic inclusions during deformation and fracture of steel with different grain sizes
[BLL-BISI-TRANS-22321-(9022.06)] N85-28072
SULFUR DIOXIDES
Gas phase ion-molecule chemistry of carbon, nitrogen and oxygen compounds
[AD-A152876] N85-27996
Absolute calibrations of SO2 and NO analyzers by photographic methods
[DFVLR-MITT-85-02] N85-28504
SULFURIC ACID
Study of the formation of sulfuric acid aerosols
[DE85-008102] N85-28011
Oxygen isotopic study of the oxidation of SO2 by H2O2 in the atmosphere
[DE85-004017] N85-28468
SUMMARIES
Experimental plasma research: Plasma summaries
[DE85-008116] N85-28805
SUNLIGHT
Terrestrial photovoltaic power systems with sunlight concentration
[DE85-008398] N85-28464
SUPERCHARGERS
Ceramic turbochargers: A case study of a near-term application of high-strength ceramics
[DE85-006495] N85-28379
Future of ceramic turbochargers: Promises and pitfalls
[DE85-006209] N85-28380
SUPERCONDUCTING MAGNETS
Effect of superconducting solenoid model cores on spanwise iron magnet roll control
[NASA-TM-86378] N85-27915
Experience with oepration of a large magnet system in the international fusion superconducting magnet test facility
[DE85-009288] N85-28721
Handbook on superconductivity: The large-scale applications. Chapter 4
[DE85-008170] N85-28838
SUPERCONDUCTIVITY
The superconducting cavity stability ruby maser oscillator N85-28324
Handbook on superconductivity: The large-scale applications. Chapter 4
[DE85-008170] N85-28838
SUPERCONDUCTORS
Research on design of cryotransformers and its prospects for the future
[AD-A152400] N85-28230
Research on superconductive signal-processing devices
[AD-A152703] N85-28235
Measuring structure functions at SSC energies
[DE85-007515] N85-28746
SUPERCRITICAL FLOW
Static and dynamic pressure measurements on a NACA 0012 airfoil in the Ames High Reynolds Number Facility
[NASA-TP-2485] N85-27823

Methods for design aerodynamics of modern transport aircraft
[DFVLR-FB-85-05] N85-27838
SUPERCRITICAL WINGS
Aerodynamic research in preparation for a new Dutch transport aircraft with supercritical wings
[B8580077] N85-27836
Analysis of unsteady pressure measurements on a supercritical airfoil with a harmonically oscillating trailing edge flap at subsonic and transonic speeds
[DFVLR-FB-84-49] N85-27837
SUPERHIGH FREQUENCIES
Radar study of the melting layer
[ESA-CR(P)-1974] N85-28527
SUPERLATTICES
Morphology of GaAs/sub 1-x/P/sub x/ superlattices grown by MOCVD and chloride VPE
[DE85-002944] N85-28842
SUPERPLASTICITY
Precision die forging of blades or gas turbines N85-28148
SUPERSATURATION
Use of principle of local equilibrium for assessing diffusional supersaturation during solidification of alloys
[BLL-BISI-TRANS-22487-(9022.06)] N85-28077
SUPERSONIC FLOW
Supersonic flow around blunt wedge N85-28158
SUPERSONIC NOZZLES
Impact starting of plane nozzles with wide divergence angle N85-28156
SUPERSONIC SPEEDS
Supersonic aerodynamic characteristics of canard, tailless, and aft-tail configurations for 2 wing planforms
[NASA-TP-2434] N85-27822
SUPERSONIC TEST APPARATUS
Analysis of heat-transfer measurements from 2 AEDC wind tunnels on the Shuttle external tank
[NASA-CR-171470] N85-28263
SUPPORT SYSTEMS
Logical design of a decision support system to forecast technology, prices and costs for the national communications system
[AD-A152330] N85-28198
SUPPORTS
Support structures for optical components in the Laser Demonstration Facility
[DE85-006879] N85-28349
Production of thin-walled electricity welded tubes with reduced internal flash
[BLL-BISI-TRANS-22381-(9022.06)] N85-28364
Buckling and bracing of cantilevers
[CE-42] N85-28413
SURFACE ACOUSTIC WAVE DEVICES
Derated application of parts for (Electronic Systems Division) systems development. Revision
[AD-A153299] N85-28246
SURFACE COOLING
Unsteady heat transfer due to time-dependent free stream velocity N85-27947
SURFACE CRACKS
Field theory analysis using the finite element method to determine the deliberation curves of three dimensional fracture mechanics specimens with a semicircular surface crack applying the electrical direct current potential method for crack depth measurement
[GKSS-84/E/53] N85-28434
SURFACE DEFECTS
Study on mechanism of surface deformation induced by stress corrosion cracking
[BLL-BISI-TRANS-21895-(9022.06)] N85-28066
SURFACE ENERGY
Fracture toughness of MgCr(sub)2O(sub)4-ZrO(sub)2
[DE85-007945] N85-27982
SURFACE FINISHING
Corrosion characteristics of some steels produced through a self-cleaning rotating electrode
[BLL-BISI-TRANS-22046-(9022.06)] N85-28034
Properties of chromate coatings formed on electrolytic zinc substrates
[BLL-BISI-TRANS-22349-(9022.06)] N85-28052
SURFACE LAYERS
Investigation of reaction layer formation in high-load capacity lubricating oils
[MPA-83-01] N85-28381
SURFACE PROPERTIES
Interaction of high-cycle and low-cycle fatigue of Haynes 188 alloy at 1400 F deg N85-27961
SURFACE REACTIONS
The role of surface generated radicals in catalytic combustion N85-27869
SURFACE ROUGHNESS
Proceedings of the 9th US Air Force and the Federal Republic of Germany Data Exchange Agreement Meeting, Viscous and Interacting Flow Field Effects
[AD-A153020] N85-28266
SURFACES
The construction of curves and surfaces using numerical optimization techniques N85-28565
A survey of patch methods N85-28567
Some negative results in N-sided patches N85-28572
SWEEP EFFECT
Design of a basic profile for a low sweep airfoil. Part 2: Experimental investigation on the DFVLR-W1 airfoil profile in the Brunswick transonic wind tunnel
[DFVLR-FB-85-01-PT-2] N85-27833
SWEPT FORWARD WINGS
Some effects of sweep direction and strakes for wings with sharp leading edges
[CA-8421] N85-27826
X-29 digital flight control system design N85-27889
SWEPT WINGS
On the effect of wing taper and sweep direction on leading edge transition
[CA-8435] N85-27827
SWEPTBACK WINGS
Some effects of sweep direction and strakes for wings with sharp leading edges
[CA-8421] N85-27826
SWITCHING
Energy considerations in second breakdown
[AD-A152389] N85-28229
Pursuit tracking performance and flash disruption: The effects of training the non-dominant eye on target reacquisition
[AD-A153404] N85-28541
SYMBOLS
Development of new circuit symbols for binary logic elements
[MBB-Z-39/85-O] N85-28640
Proposal for the systematic naming of mesons and baryons
[DE85-006453] N85-28773
SYMMETRICAL BODIES
The Mises yield condition for thin rotationally symmetric shells
[BLL-BISI-TRANS-22047-(9022.06)] N85-28409
SYMMETRY
Chemical applications of topology and group theory. 17: An information theoretical approach to polyhedral symmetry
[AD-A152821] N85-27995
Lattice actions improved by block-spin renormalisation group and maximally symmetric lattices
[DE85-007416] N85-28841
SYNCHRONISM
UHF IRIG G distribution system N85-28308
Precise time transfer using MKIII VLBI technology N85-28310
Time synchronization experiments with APPLE N85-28323
SYNCHROTRONS
Experiments with light ions at CERN super proton synchrotron
[DE85-007625] N85-28744
Alternating gradient synchrotron
[DE85-005950] N85-28759
Muon spin rotation studies N85-28819
SYNOPTIC METEOROLOGY
Statistical interpretation of the ECMWF model using MOS to predict surface wind and temperature
[WSR-2] N85-28515
Towards a study of synoptic-scale variability of the California current system
[NASA-CR-175871] N85-28529
SYNTHESIS (CHEMISTRY)
Michelle-derived catalysts for extended Schulz-Flory
[DE85-005656] N85-28012
Polyaromatic ether-sulfone-keytones with fluoro-substituted-p-cyclophane units as cross-linking sites
[AD-D011649] N85-28105
Preparation of silicon carbide-silicon nitride fibers by the pyrolysis of polycarbosilazane precursors
[NASA-TM-86505] N85-28107
New examples of clusters, extended metal-metal bonding and interstitial derivatives
[DE85-005926] N85-28837
SYNTHETIC APERTURE RADAR
Application of artificial intelligence (AI) to radar image understanding
[AD-A152519] N85-28654
SYNTHETIC FIBERS
Fatigue of synthetic fibers for marine rope applications
[MIT-R84-2] N85-28414
Fatigue behavior of synthetic fibers, yarns and ropes N85-28415
The effects of sea water and concentrated salt solutions on the fatigue of nylon 6,6 fibers N85-28416
SYSTEM FAILURES
How to handle failures in advanced flight control systems of future transport aircraft N85-27905
SYSTEM IDENTIFICATION
Identification of gust input and gust response characteristics from Do 28 TNT flight test data
[DFVLR-FB-84-48] N85-27881
SYSTEMS ANALYSIS
An ultrasensitive and element specific photoionization detection system for environmental analysis
[AD-A153365] N85-28332
System analysis of a field Army Topographic Support System
[AD-A153318] N85-28439
System Analysis for the Huntsville Operation Support Center, Distributed Computer System
[NASA-CR-171506] N85-28642
An examination of alternative forms of fit in contingency theory
[AD-A152602] N85-28853
The concept of fit in contingency theory
[AD-A152603] N85-28854
Experimental philosophy leading to a small scale digital data base of the conterminous United States for designing experiments with remotely sensed data
[NASA-TM-85009] N85-28877
SYSTEMS ENGINEERING
Analysis of control system from a viewpoint of desired pole placement and desired degree of robustness
[AD-A152627] N85-27876
The gust simulation apparatus of the 3m x 3m low speed wind tunnel of the DFVLR in Goettingen, West Germany
[DFVLR-FB-85-04] N85-27920
Engineering robot actions in a computer integrated manufacturing environment
[CWI-CS-R8415] N85-28139
Performance analysis of the DSN baseband assembly (Bba) Real-Time Combiner (RTC)
[NASA-CR-175878] N85-28190
NASA guidelines for assuring the adequacy and appropriateness of security safeguards in sensitive applications
[NASA-CR-175489] N85-28593
The touch panel system: Design and development
[AD-A153014] N85-28596
A test methodology for an automated and interactive software development environment
[AD-A152857] N85-28618
Impurity control and vacuum pumping system design and analysis for next-generation Tokamaks
[DE85-009291] N85-28815
Complete development and implement AFIT/ENG database management system, volume 1
[AD-A153043] N85-28866
The development of information systems at NLR
[B8580079] N85-28884
SYSTEMS INTEGRATION
The STOL and maneuver technology program integrated control system development N85-27910
SYSTEMS SIMULATION
A complete inference system for regular processes with silent moves
[CWI-CS-R8420] N85-28638

T

TACAN
Distance Measuring Equipment (DME), general
[AD-A152585] N85-27846
TAKEOFF
A system for take-off and landing measurements (STALINS)
[B8580072] N85-27849
Addition of flexible body option to the TOLA computer program, part 1
[NASA-CR-132732-1] N85-27855
Addition of flexible body option to the TOLA computer program. Part 2: User and programmer documentation
[NASA-CR-132732-2] N85-27856
TARGETS
Angular tracking error in A phase comparison monopulse tracking radar: A critical review and extension of the phase front distortion approach
[AD-A152628] N85-28205
Tracking algorithm performance analysis program (TRAPP)
[DE85-007304] N85-28601
TEA LASERS
Obtaining amorphous coatings of FeW and Fe-Cr-P-B alloys using laser sputtering
[BLL-BISI-22493-(9022.06)] N85-28057
TECHNOLOGICAL FORECASTING
In orbit infrastructure. Volume 1: Executive summary — European space programs
[RX011-002/84-VOL-1] N85-27928

Aluminum-lithium alloys: The answer of the aluminum industry to the threat of advanced fiber-reinforced materials
[VTH-LR-406] N85-28102
Logical design of a decision support system to forecast technology, prices and costs for the national communications system
[AD-A152330] N85-28198
Air Force technical objective document FY 86
[AD-A152730] N85-28855

TECHNOLOGIES
The Department of Defense statement on the Science and Technology Program by Colonel Donald I. Carter, USAF Acting Deputy Under Secretary of Defense for Research and Advanced Technology before the Subcommittee on Research and Development of the Committee on Armed Services of the United States House of Representatives, 99th Congress, first session
[AD-A152467] N85-28850
The outlook for Soviet advanced technologies
[AD-P004564] N85-28859
Technology and Soviet political choices
[AD-P004566] N85-28861

TECHNOLOGY ASSESSMENT
Controller requirements for uncoupled aircraft motion, volume 1
[AD-A153173] N85-27878
Glassy metals: New highly resistant material
[BLL-BISI-TRANS-21764-(9022.06)] N85-28049
USSR report: Science and technology policy
[JPRS-UST-85-006] N85-28872
General laws of development of technology N85-28875
Advanced vehicle systems assessment. Volume 1: Executive summary
[NASA-CR-175876] N85-28887

TECHNOLOGY TRANSFER
West Europe report: Science and technology
[JPRS-WST-84-024] N85-28183
Technology and Soviet political choices
[AD-P004566] N85-28861
Close encounters with S/T (science and technology) in the Soviet Union
[AD-P004570] N85-28864
Catalog of research projects at Lawrence Berkeley Laboratory, 1985
[DE85-008679] N85-28869
Report to Congress on the Automotive Technology Development Program
[DE85-005640] N85-28890

TECHNOLOGY UTILIZATION
New materials and techniques for aircraft structures
[B8580074] N85-27861
Automation and robotics for the National Space Program
[NASA-CR-175881] N85-27936
Aluminum-lithium alloys: The answer of the aluminum industry to the threat of advanced fiber-reinforced materials
[VTH-LR-406] N85-28102
Hot Isostatic Pressing (HIP): Techniques, applications and economical use
[JUEL-SPEZ-288] N85-28141
USSR report: Engineering and equipment
[JPRS-UEQ-85-004] N85-28142
Applications of robots in machine tool industry reviewed N85-28189
Catalog of research projects at Lawrence Berkeley Laboratory, 1985
[DE85-008679] N85-28869
General laws of development of technology N85-28875

TECTONICS
A traveltime interpretation of the 1978 seismic refraction profile in the Kingdom of Saudi Arabia N85-28486

TELECOMMUNICATION
East Europe report: Science and technology
[JPRS-ESA-85-017] N85-28177
Radiometer integrated into a communication terminal
[AD-A151746] N85-28195
Logical design of a decision support system to forecast technology, prices and costs for the national communications system
[AD-A152330] N85-28198
ELF (Extremely Low Frequency) communications system ecological monitoring program: Measurements of ELF electromagnetic fields for site selection and characterization, 1983
[AD-A153120] N85-28209
Moon bounce communications to small terminals
[AD-A153297] N85-28212
Discrete mathematics for communications systems
[AD-A152814] N85-28664
Rome Development Center Air Force technical objective document C3I FY-86
[AD-A152476] N85-28851

TELEOPERATORS
Hand controllers for teleoperation. A state-of-the-art technology survey and evaluation
[NASA-CR-175890] N85-28559

TELESCOPES
Holographic corrector in objective with compound main mirror N85-28153

TELEVISION RECEPTION
Timing accuracy of LF and TV synchronization techniques N85-28288

TELEVISION SYSTEMS
Mobile television radio link
[AD-A152381] N85-28201

TELEVISION TRANSMISSION
Mobile television radio link
[AD-A152381] N85-28201
Timing accuracy of LF and TV synchronization techniques N85-28288
Unattended TV time transfer results N85-28305

TEMPERATURE CONTROL
Erosion of corrosion-resistant surface treatments on alloy steels
[DE85-008446] N85-28100
A ten channel temperature controller
[AD-A152664] N85-28326
Microprocessor controlled temperature chassis
[DE85-008392] N85-28602

TEMPERATURE DEPENDENCE
Mechanical properties of polycrystalline alpa titanium
[BLL-BISI-TRANS-21923-(9022.06)] N85-28029
Physical properties of steels and their temperature dependence
[BLL-BISI-TRANS-22285-(9022.06)] N85-28065
Temperature and manganese content dependences of tensile deformation in iron-high manganese binary alloys
[DE85-007656] N85-28098
The temperature dependence of diffracted beam intensities in atom-surface scattering
[AD-A152762] N85-28736

TEMPERATURE EFFECTS
High-thermal-gradient superalloy crystal growth N85-27966
Influence of temperature in melting and casting on quality of medium-alloy steel
[BLL-BISI-TRANS-22310-(9902.06)] N85-28137
Effects of level broadening on the magnetothermal oscillations in two-dimensional electron systems
[AD-A152639] N85-28732

TEMPERATURE INVERSIONS
Average collisional vibrational energy transfer quantities and the inversion temperature
[AD-A152674] N85-28733

TEMPERATURE MEASUREMENT
High resolution spectroscopy of C13O16 in gas mixtures
[AD-A152625] N85-27991
NMR manometer for measuring high pressures at liquid-helium temperatures N85-28171
Apparatus for measuring velocity of sound in fluids N85-28175
Observations of surface water temperature in the Netherlands since 1860: Statistics
[KNMI-WR-84-3] N85-28531
Observations of surface water temperature in the Netherlands since 1860: Tables for light vessels
[KNMI-WR-84-4] N85-28532
Observations of surface water temperature in the Netherlands since 1860: Series from KNMI-RWS
[KNMI-WR-84-5] N85-28533

TEMPERATURE PROFILES
An investigation into the soot production processes in a gas turbine engine
[AD-A152710] N85-27992

TEMPERING
Powder-metallurgy alloys and steels
[BLL-BISI-TRANS-22239-(9022.06)] N85-28050
The characteristic structure of weld metal of high temperature alloy X20CrMoV 121
[BLL-BISI-TRANS-21623-(9022.06)] N85-28069
Study to optimize Cr-Mo steels to resist hydrogen and temper embrittlement
[DE85-005492] N85-28096

TENSILE PROPERTIES
Temperature and manganese content dependences of tensile deformation in iron-high manganese binary alloys
[DE85-007656] N85-28098

TENSILE STRENGTH
SRB filament wound case material property study
[NASA-CR-171469] N85-27940
Role of hydrogen and structure on CMSX-2 N85-27967

TENSILE TESTS
MM2 LRSLA testing stage 3 propellant
[AD-A152540] N85-28128

TENSOR ANALYSIS
Boundary layer and parabolic flows
[DFVLR-FB-84-46] N85-28285

TERMINOLOGY
Systematic nomenclature of the nitrogen, oxygen and sulfur functional polycyclic aromatic hydrocarbons
[DE85-007426] N85-27974

TERNARY ALLOYS
Influence of composition on the microstructural evolution and mechanical properties of irradiated Fe-Ni-Cr ternaries
[DE85-007462] N85-28094

TERRAIN
Structural analysis of terrane accretions in the eastern Brooks Range and adjacent areas in central Alaska and Canada
[DE85-008279] N85-28501
Application of artificial intelligence (AI) to radar image understanding
[AD-A152519] N85-28654

TERRAIN ANALYSIS
Structural analysis of terrane accretions in the eastern Brooks Range and adjacent areas in central Alaska and Canada
[DE85-008279] N85-28501

TERRESTRIAL RADIATION
Comparison of measurement and simulation results of radiation temperatures applied to the thermal mapping of Munich
[DFVLR-FB-85-06] N85-28442

TEST FACILITIES
An assessment of the suitability of the BHGA structural test rig for aerodynamic testing of hang gliders
[CA-8505] N85-27853
Rotorcraft research testing in the National Full-Scale Aerodynamics Complex at NASA Ames Research Center
[NASA-TM-86687] N85-27854
Experience with oepration of a large magnet system in the international fusion superconducting magnet test facility
[DE85-009288] N85-28721
An Impurity Control Test Facility (ICTF) for the study of fusion reactor/plasma edge materials
[DE85-007946] N85-28810

TEST STANDS
Test devices for aeronautical research and technology
[NASA-TM-77651] N85-27914
Data processing on the rotor test stand at DFVLR in Brunswick: Microprogrammable interfaces and array processor as key components in a PDP 11 real time data acquisition and processing system
[DFVLR-MITT-85-03] N85-27921

TETHERED SATELLITES
Shuttle-tethered satellite system definition study extension
[NASA-CR-171473] N85-27923
Shuttle-tethered satellite system definition study. Volume 1: Executive study
[NASA-CR-171474] N85-27924

TETHERLINES
Shuttle-tethered satellite system definition study. Volume 1: Executive study
[NASA-CR-171474] N85-27924

TEXTURES
Textural transformations taking place during heat and mechanical treatment in triplex steels
[BLL-BISI-TRANS-22404-(9022.06)] N85-28063

THEOREMS
Extension of three theorems of Fourier series on the disc to the torus
[AD-A153017] N85-28669
Central limit theorems in the area of large deviations for some dependent random variables
[AD-A153125] N85-28831

THERMAL ANALYSIS
Analysis of physical-chemical processes governing SSME internal fluid flows
[NASA-CR-175893] N85-28261

THERMAL CONTROL COATINGS
Erosion of corrosion-resistant surface treatments on alloy steels
[DE85-008446] N85-28100

THERMAL EMISSION
Pressed boride cathodes
[NASA-TM-77821] N85-27984

THERMAL EXPANSION
Thermal expansion effects in electrical transport in amorphous metals
[AD-A152477] N85-28089

THERMAL FATIGUE
High-thermal-gradient superalloy crystal growth N85-27966

THERMAL INSULATION
Heat resistant sheathed insulated electrical conductors
[AD-D011644] N85-28219
THERMAL MAPPING
Comparison of measurement and simulation results of radiation temperatures applied to the thermal mapping of Munich
[DFVLR-FB-85-06] N85-28442
THERMAL PLASMAS
Plasma processing of materials
[AD-A152398] N85-28800
THERMAL RESISTANCE
Heat resistant Carbon Fiber Reinforced Plastics (CFRP) hardening equipment
[MBB/LFA33/CFK/PUB/007] N85-27976
Dispersion-strengthened powder-metallurgical chromium steels
[BLL-BISI-TRANS-22323-(9022.06)] N85-28081
Investigations of the material factors in the adiabatic shearing of steels
[AD-A153084] N85-28418
THERMAL STABILITY
Thermally stable elastomers: Review of silarylene-siloxane polymers and polysilmethylenes
[AD-A152323] N85-28111
THERMIONIC CATHODES
Pressed boride cathodes
[NASA-TM-77821] N85-27984
THERMOCHEMICAL PROPERTIES
Influence of thermochemical treatment on properties of low-carbon steel
[BLL-BISI-TRANS-22410-(9022.06)] N85-28055
THERMOCHEMISTRY
Gas phase ion-molecule chemistry of carbon, nitrogen and oxygen compounds
[AD-A152876] N85-27996
Elementary reactions of importance in oxidation, combustion ignition and flame inhibitions
[AD-A153139] N85-28004
Influence of preliminary thermomechanical treatment on depth and hardness of nitrided layers
[BLL-BISI-TRANS-22488-(9022.06)] N85-28078
Alcohol Fuels Program technical review, spring 1984
[DE85-002919] N85-28134
THERMOCOUPLE PYROMETERS
Thin-film sensors for space propulsion technology N85-27968
THERMOCOUPLES
A ten channel temperature controller
[AD-A152664] N85-28326
Heating parameter estimation using coaxial thermocouple gages in wind tunnel test articles
[AD-A153039] N85-28328
THERMODYNAMIC EQUILIBRIUM
Thermodynamic calculations of equilibrium states in metal-carbon-hydrogen-oxygen system
[BLL-BISI-TRANS-22092-(9022.06)] N85-28844
THERMODYNAMIC PROPERTIES
Investigation of heat transfer to a turbine blade cascade using a shock tube
[AD-A153090] N85-27871
Thermodynamic analysis of the plasma nitriding of ferrovanadium
[BLL-BISI-TRANS-22237-(9022.06)] N85-28032
Analysis and modeling for thermal focal plane arrays
[AD-A153156] N85-28329
Thermodynamic calculations of equilibrium states in metal-carbon-hydrogen-oxygen system
[BLL-BISI-TRANS-22092-(9022.06)] N85-28844
THERMODYNAMICS
Dynamic creep buckling: Analysis of shell structures subjected to time-dependent mechanical and thermal loading N85-27959
Designing for fiber composite structural durability in hygrothermomechanical environment
[NASA-TM-87045] N85-27978
Silica problem in the design of geothermal power plants
[DE85-008245] N85-28453
Homogeneous processes of atmospheric interest
[NASA-CR-175770] N85-28475
Effects of level broadening on the magnetothermal oscillations in two-dimensional electron systems
[AD-A152639] N85-28732
THERMOMECHANICAL TREATMENT
Thermomechanical softening treatment for bearing and tool steels
[BLL-BISI-TRANS-22432-(9022.06)] N85-28035
Thermomechanical treatment aimed at the protection of type 316 stainless steel from IGC and IGSCC
[BLL-BISI-TRANS-22498-(9022.06)] N85-28040
THERMOPLASTIC RESINS
Finland, Sweden cooperate in composites research N85-28184
THIAZINE (TRADEMARK)
The electrochemistry of azine, oxazine and thiazine dyes
[AD-A152394] N85-27990
THIN FILMS
Thin-film sensors for space propulsion technology N85-27968
In situ HVEM studies of electron beam-driven compositon changes in thin film alloys: Displacement-rate gradient effects
[DE85-007992] N85-28092
Thin films properties of sputtered niobium silicide on SiO2, Si3N4 and on n+ poly-Si
[AD-A152378] N85-28228
Technology development for thin-film-trace humidity sensors
[BMFT-FB-T-84-268] N85-28338
Research and developmental study on MIS thin film solar cells of amorphous hydrogenated silicon, part 2
[BMFT-FB-T-84-290] N85-28467
THIN WALLED SHELLS
Dynamic creep buckling: Analysis of shell structures subjected to time-dependent mechanical and thermal loading N85-27959
Initial imperfection surveys on conical shells at Hoechst AG
[VTH-LR-407] N85-28429
THREAT EVALUATION
Space Station crew safety alternatives study. Volume 5: Space Station safety plan
[NASA-CR-3858] N85-27930
THRUST BEARINGS
Calculation of friction at spherical bearing journals in turbomachines N85-28150
THRUST LOADS
Calculation of friction at spherical bearing journals in turbomachines N85-28150
Characteristics of a confined jet thrust vector control nozzle
[AD-A153087] N85-28268
THRUST VECTOR CONTROL
Characteristics of a confined jet thrust vector control nozzle
[AD-A153087] N85-28268
TIDES
Tidal rectification in lateral viscous boundary layers of a semienclosed basin
[CWI-AM-R8415] N85-28284
TIME DEPENDENCE
Analysis of time dependent dielectric failures
[AD-A153200] N85-28243
New time and frequency services at the National Bureau of Standards N85-28289
Distributed elections in a ring of processors using Archimedean time
[CWI-CS-R8416] N85-28653
The temperature dependence of diffracted beam intensities in atom-surface scattering
[AD-A152762] N85-28736
Model computations of radon, and radon decay product, concentrations in an open system; the Hewlett-Packard 41C program RNSS, version 02
[IRI-190-83-12] N85-28775
The strategy for time dependent quantum mechanical calculations using a Gaussian wave packet representation of the wave function
[AD-A152709] N85-28845
TIME LAG
Proceedings of the Fifteenth Annual Precise Time and Time Interval (PTTI) Applications and Planning Meeting
[AD-A149163] N85-28287
Timing accuracy of LF and TV synchronization techniques N85-28288
International time comparison by a GPS timing receiver N85-28293
First results of GPS time transfer to Australia N85-28294
The role of a low Earth orbiter in intercontinental time synchronization via GPS satellites N85-28306
TIME MEASUREMENT
Proceedings of the Fifteenth Annual Precise Time and Time Interval (PTTI) Applications and Planning Meeting
[AD-A149163] N85-28287
Recent improvements in the atomic time scales of the National Bureau of Standards N85-28290
Improved master clock reference system at USNO N85-28300
Spread spectrum time transfer experiment via INTELSAT N85-28304
Timing-system design considerations for a mobile astrolabe N85-28309
Clock characterization tutorial N85-28311
Methods for optimal recursive estimation of non-stationary time series, applications to atomic time and frequency metrology N85-28312
Kalman filter estimates of the NAVSTAR satellite clock parameters N85-28315
The measurement of linear frequency drift in oscillators N85-28316
A plan for the development of inertial reconstruction of initial state clock (IRIS) N85-28317
TIME MEASURING INSTRUMENTS
The steering of GPS time N85-28301
Spread spectrum time transfer experiment via INTELSAT N85-28304
TIME SERIES ANALYSIS
Methods for optimal recursive estimation of non-stationary time series, applications to atomic time and frequency metrology N85-28312
Towards a study of synoptic-scale variability of the California current system
[NASA-CR-175871] N85-28529
TIME SIGNALS
Proceedings of the Fifteenth Annual Precise Time and Time Interval (PTTI) Applications and Planning Meeting
[AD-A149163] N85-28287
Timing accuracy of LF and TV synchronization techniques N85-28288
New time and frequency services at the National Bureau of Standards N85-28289
Recent improvements in the atomic time scales of the National Bureau of Standards N85-28290
Automation of Precise Time Reference Stations (PTRS) N85-28291
International time comparison by a GPS timing receiver N85-28293
A new precision time and frequency source for stationary PTTI applications N85-28297
On-orbit frequency stability analysis of the GPS NAVSTAR's 3 and 4 rubidium clocks and NAVSTAR's 5 and 6 cesium clocks N85-28298
Improved master clock reference system at USNO N85-28300
The steering of GPS time N85-28301
Test results for prototype GPS rubidium clocks N85-28302
Spread spectrum time transfer experiment via INTELSAT N85-28304
Unattended TV time transfer results N85-28305
The role of a low Earth orbiter in intercontinental time synchronization via GPS satellites N85-28306
Timing of spacecraft data: Time accuracy requirements and timing facilities of the European Space Agency (ESA) N85-28307
UHF IRIG G distribution system N85-28308
Precise time transfer using MKIII VLBI technology N85-28310
Kalman filter estimates of the NAVSTAR satellite clock parameters N85-28315
Time synchronization experiments with APPLE N85-28323
TIMING DEVICES
Proceedings of the Fifteenth Annual Precise Time and Time Interval (PTTI) Applications and Planning Meeting
[AD-A149163] N85-28287
New time and frequency services at the National Bureau of Standards N85-28289
Recent improvements in the atomic time scales of the National Bureau of Standards N85-28290
International time comparison by a GPS timing receiver N85-28293
International time transfer and portable clock evaluation using GPS timing receivers: Preliminary results N85-28303
TITANIUM
Mechanical properties of polycrystalline alpa titanium
[BLL-BISI-TRANS-21923-(9022.06)] N85-28029
TITANIUM ALLOYS
Effects of the phase compositions of cast low-pearlite steels micro-alloyed with vanadium and titanium of their structure and properties
[BLL-BISI-TRANS-22301-(9022.06)] N85-28067
Titanium metal-matrix composites
[AD-D011643] N85-28086
The disordering process in an L12 ordered alloy
[DE85-008152] N85-28093
TITANIUM BORIDES
Study of self-propagating condensed phase reactions TiB(2) synthesis
[AD-A153198] N85-28006
TOKAMAK DEVICES
Accelerator-based plasma-wall interaction studies on the TEXTOR Tokamak
[DE85-007540] N85-28806
Tokamak fusion core experiment maintenance study
[DE85-008040] N85-28813
The transport of neutral H, D, T and He and O in the boundary layers of a Tokamak plasma
[REPT-84-153] N85-28817

TOLERANCES (MECHANICS)
Probabilistic structural analysis of SSME turbopump blades: Probabilistic geometry effects N85-27958
TOOLS
Printed wiring board circuit isolator tool [AD-D011638] N85-28333
TOPOGRAPHY
System analysis of a field Army Topographic Support System [AD-A153318] N85-28439
A discussion of adaptive grids and their applicability in numerical hydrodynamic modeling [AD-A151843] N85-28659
TOPOLOGY
Chemical applications of topology and group theory. 17: An information theoretical approach to polyhedral symmetry [AD-A152821] N85-27995
The definition and computation of a metric on plane curves. The meaning of a face on a geometric model N85-28571
Some negative results in N-sided patches N85-28572
Contouring trivariate data N85-28582
TOROIDS
Experience with oepration of a large magnet system in the international fusion superconducting magnet test facility [DE85-009268] N85-28721
TORQUE
Calculation of friction at spherical bearing journals in turbomachines N85-28150
TORSION
Buckling and bracing of cantilevers [CE-42] N85-28413
TORUSES
Torus data flow for parallel computation of missized matrix problems [DE85-006761] N85-28715
TOUCH
The touch panel system: Design and development [AD-A153014] N85-28596
TRACE ELEMENTS
An ultrasensitive and element specific photoionization detection system for environmental analysis [AD-A153365] N85-28332
TRACKING (POSITION)
Development of mass-producible line-focus tracking concentrating solar collectors. Category 2: Control systems [DE85-007873] N85-28459
Automatic detection of gust fronts [FAA/PM-85-11] N85-28516
Tracking algorithm performance analysis program (TRAPP) [DE85-007304] N85-28601
TRACKING RADAR
Angular tracking error in A phase comparison monopulse tracking radar: A critical review and extension of the phase front distortion approach [AD-A152628] N85-28205
TRAINING EVALUATION
Guidelines of the Federal Minister of Transportation for the formation and examination of airline personnel, part 4 N85-28556
TRAJECTORIES
The mean trajectory approximation for charge and energy transfer processes at surfaces [AD-A152708] N85-28830
Lattice actions improved by block-spin renormalisation group and maximally symmetric lattices [DE85-007416] N85-28841
TRAJECTORY ANALYSIS
Computer program for prediction of capture maneuver probability for an on-off reaction controlled upper stage [NASA-CR-165937] N85-28611
The role of thermal motions of air particles for fireballs [PUBL-59] N85-28900
TRAJECTORY OPTIMIZATION
A numerical study of the mean trajectory approximation in a non-adiabatic process [AD-A152763] N85-28737
TRANSDUCERS
Liquid-metal transducers for strain measurement during in-pile materials testing N85-28176
TRANSFER FUNCTIONS
Generalised translation invariance and systems theory [CRM-8501] N85-28657
TRANSFER ORBITS
Primary propulsion of electrothermal, ion and chemical systems for space-based radar orbit transfer [NASA-TM-87043] N85-27972
TRANSFERRING
A new technique for system-to-system transfer of surface data N85-28589
TRANSFORMATIONS (MATHEMATICS)
Solution to eigenvalue problems of antisymmetric cross-ply and antisymmetric angle-ply laminated plates using affine transformations [AD-A153040] N85-27980
Curved finite elements and curve approximation N85-28590
Investigation and implementation of a tree transformation system for user friendly programming [AD-A152716] N85-28617
Generalised translation invariance and systems theory [CRM-8501] N85-28657
TRANSFORMERS
Research on design of cryotransformers and its prospects for the future [AD-A152400] N85-28230
TRANSIENT RESPONSE
Continuum modeling of latticed structures N85-28399
TRANSISTORS
Energy considerations in second breakdown [AD-A152389] N85-28229
TRANSITION METALS
Thermodynamic analysis of the plasma nitriding of ferrovanadium [BLL-BISI-TRANS-22237-(9022.06)] N85-28032
Clusters of transition metal atoms [AD-A153126] N85-28740
New examples of clusters, extended metal-metal bonding and interstital derivatives [DE85-005926] N85-28837
TRANSMISSION LINES
Multiconductor flat cable [AD-D011635] N85-28218
Performance analysis of radiation cooled dc transmission lines for high power space systems [NASA-TM-87040] N85-28222
TRANSONIC FLOW
Numerical study of porous airfoils in transonic flow [NASA-TM-86713] N85-27828
Transonic Mach number determination in a blow-down wind tunnel with solid walls and a downstream throat [VTH-LR-402] N85-27835
Navier-Stokes computational study of axisymmetric transonic turbulent flows with a two-equation model of turbulence [AD-A152653] N85-28265
Proceedings of the 9th US Air Force and the Federal Republic of Germany Data Exchange Agreement Meeting, Viscous and Interacting Flow Field Effects [AD-A153020] N85-28266
TRANSONIC SPEED
Analysis of unsteady pressure measurements on a supercritical airfoil with a harmonically oscillating trailing edge flap at subsonic and transonic speeds [DFVLR-FB-84-49] N85-27837
TRANSONIC WIND TUNNELS
Design of a basic profile for a low sweep airfoil. Part 2: Experimental investigation on the DFVLR-W1 airfoil profile in the Brunswick transonic wind tunnel [DFVLR-FB-85-01-PT-2] N85-27833
Transonic Mach number determination in a blow-down wind tunnel with solid walls and a downstream throat [VTH-LR-402] N85-27835
TRANSPARENCE
Measurement of ultrasonic fields in transparent media using a scanning differential interferometer [NASA-CR-175921] N85-28726
TRANSPIRATION
Study of a constricted electric arc cooled by transpiration [NASA-TM-77846] N85-28798
TRANSPORT AIRCRAFT
Methods for design aerodynamics of modern transport aircraft [DFVLR-FB-85-05] N85-27838
Friction and wear behavior of aluminum and composite I-beam stiffened airplane skins [NASA-TM-86418] N85-27852
Demonstration of relaxed static stability on a commercial transport N85-27898
Realisation of relaxed static stability on a commercial transport N85-27899
Wing buffeting active control testing on a transport aircraft configuration in a large sonic windtunnel N85-27903
How to handle failures in advanced flight control systems of future transport aircraft N85-27905
TRANSPORT THEORY
Limiting profiles in contaminant transport through porous media — ground water pollution [REPT-84-31] N85-28282
Projected discrete ordinates methods for numerical transport problems [DE85-005632] N85-28678
Augmented weighted diamond force of the linear nodal scheme for Cartesian coordinate systems [DE85-005631] N85-28679
Examination of a method for predicting the properties of railgun plasmas [AR-004-322] N85-28799
TRANSPORTATION
USSR report: Transportation [JPRS-UTR-84-025] N85-27841
Test devices for aeronautical research and technology [NASA-TM-77851] N85-27914
Tribological sinks: Money down the drain [DE85-010019] N85-28376
TRAVELING WAVE TUBES
Construction techniques of a molecular hydrogen laser [AD-A152928] N85-28343
TREES (MATHEMATICS)
Investigation and implementation of a tree transformation system for user friendly programming [AD-A152716] N85-28617
TRENDS
Future directions in operations research [REPT-84-24] N85-28711
TRIBOLOGY
Tribological sinks: Money down the drain [DE85-010019] N85-28376
TRIGGER CIRCUITS
Construction techniques of a molecular hydrogen laser [AD-A152928] N85-28343
TRINITROTOLUENE
Voltammetric analysis of ordnance materials. Part 2: A portable digital voltammeter for use with a silver wire working electrode [AD-A152480] N85-28325
TRITIUM
Two-dimensional TBR calculations for conceptual compact reversed-field pinch reactor blanket [DE85-007636] N85-28812
TROPICAL STORMS
Characteristics of North Indian Ocean tropical cyclone activity [AD-A153085] N85-28524
TRUCKS
Test plan for acceptance, verification and performance testing of the Bedford Lucas Chloride Electric Van. Part 1: Acceptance and verification testing at EG and G Automotive Research. Part 2: INEL performance testing, revision 1 [DE85-005157] N85-28888
TRUSSES
Deployable controllable geometry truss beam [NASA-TM-86366] N85-27934
TUNABLE LASERS
High resolution spectroscopy of C13O16 in gas mixtures [AD-A152625] N85-27991
The construction and study of improved Al(x)Ga(1-x)As-GaAs heterostructure devices [AD-A153264] N85-28244
TUNGSTEN
Continued development and testing of tungsten controlled porosity dispenser cathodes [AD-A152595] N85-28090
TUNNEL DIODES
Spectroscopy of surface adsorbed molecules [DE85-009452] N85-28768
TURBINE BLADES
Investigation of heat transfer to a turbine blade cascade using a shock tube [AD-A153090] N85-27871
Testing of materials and coatings for jet engine components under simulated operational conditions [B8580073] N85-27873
SSME turbopump turbine computations N85-27944
Probabilistic structural analysis of SSME turbopump blades: Probabilistic geometry effects N85-27958
Structural tailoring of SSME blades (vanes) N85-27960
Cyclic structural analyses of SSME turbine blades N85-27963
Effects of high mean stress on high-cycle fatigue behavior of PWA 1480 N85-27964
TURBINE ENGINES
New facility to study unsteady wake effects on turbine airfoil heat transfer N85-27948
USSR report: Engineering and equipment [JPRS-UEQ-85-004] N85-28142
Flow characteristics of a partially submerged liquid pickup [DE85-008744] N85-28276
TURBINE PUMPS
SSME fuel preburner two-dimensional analysis N85-27943
SSME turbopump turbine computations N85-27944
Probabilistic structural analysis of SSME turbopump blades: Probabilistic geometry effects N85-27958

Cyclic structural analyses of SSME turbine blades N85-27963
Constitutive cyclic deformation behavior in single-crystal and directionally solidified SSME high-pressure fuel turbopump airfoil materials N85-27965
TURBINE WHEELS
Unsteady heat transfer due to time-dependent free stream velocity N85-27947
Experimental measurements and analysis of heat transfer and gas dynamics in a rotating turbine stage N85-27949
TURBINES
Ceramic turbochargers: A case study of a near-term application of high-strength ceramics [DE85-006495] N85-28379
TURBOCOMPRESSORS
Simulation of multistage turbine flows N85-27945
Unsteady flow in multistage turbines N85-27946
Precision die forging of blades or gas turbines N85-28148
Ceramic turbochargers: A case study of a near-term application of high-strength ceramics [DE85-006495] N85-28379
Future of ceramic turbochargers: Promises and pitfalls [DE85-006209] N85-28380
TURBOFAN ENGINES
Spacer structure [AD-D011641] N85-27866
Fan noise suppression in turbofan engines [B8580078] N85-27872
TURBOMACHINE BLADES
A study of internal and distributed damping for vibrating turbomachiner blades [NASA-CR-175901] N85-27868
Unsteady heat transfer due to time-dependent free stream velocity N85-27947
Experimental measurements and analysis of heat transfer and gas dynamics in a rotating turbine stage N85-27949
Composite loads spectra for select space propulsion structural components N85-27953
TURBOMACHINERY
Simulation of multistage turbine flows N85-27945
Vibrations of rotors connected through couplings with backlash N85-28147
Calculation of friction at spherical bearing journals in turbomachines N85-28150
TURBULENCE
Kolmogorov and scalar spectral regimes in numerical turbulence [NASA-TM-86699] N85-28264
Parameterization of subgrid-scale fluxes in mesoscale meteorological models [AD-A153016] N85-28523
TURBULENT BOUNDARY LAYER
Navier-Stokes computational study of axisymmetric transonic turbulent flows with a two-equation model of turbulence [AD-A152653] N85-28265
TURBULENT FLOW
An introduction to vortex breakdown and vortex core bursting [NAE-AN-28] N85-27829
SSME turbopump turbine computations N85-27944
An experimental investigation of a turbulent junction vortex [NASA-CR-175915] N85-28259
Heat transfer in pipes [NASA-TM-77838] N85-28262
Navier-Stokes computational study of axisymmetric transonic turbulent flows with a two-equation model of turbulence [AD-A152653] N85-28265
Coherent structure reflective turbulent viscous flow modeling [AD-A153086] N85-28267
TURBULENT MIXING
Kolmogorov and scalar spectral regimes in numerical turbulence [NASA-TM-86699] N85-28264
TURBULENT WAKES
New facility to study unsteady wake effects on turbine airfoil heat transfer N85-27948
TURING MACHINES
Counting is easy — Turing machines [CWI-CS-R8423] N85-28606
TWO DIMENSIONAL FLOW
Supersonic flow around weak radiation sources N85-28162
TWO PHASE FLOW
Flow characteristics of a partially submerged liquid pickup [DE85-006744] N85-28276

U

U.S.S.R.
USSR report: Transportation [JPRS-UTR-84-025] N85-27841
Science and Technology in the Soviet Union [AD-A152828] N85-28856
Soviet weapons development and the scientific community [AD-P004562] N85-28857
Computing in the Soviet general economy: An introductory overview [AD-P004563] N85-28858
The outlook for Soviet advanced technologies [AD-P004564] N85-28859
Social and political problems in Soviet basic research [AD-P004565] N85-28860
Technology and Soviet political choices [AD-P004566] N85-28861
Technology and technical efficiency in the Soviet Union: Dominant patterns of constrained optimization in a noncompetitive economic regime [AD-P004567] N85-28862
The revolution in military affairs and the Soviet system [AD-P004568] N85-28863
Close encounters with S/T (science and technology) in the Soviet Union [AD-P004570] N85-28864
R/D contracts in the Soviet Union [AD-P004569] N85-28865
ULTRAHIGH FREQUENCIES
FAA (Federal aviation administration) assessment of satellite concepts and aviation spectrum requirements [AD-A152338] N85-28199
ULTRASONIC FLAW DETECTION
Ultrasonic flaw detector with microcomputer interpretation [BMFT-FB-T-84-272] N85-28395
Detecting and analyzing crack defects [BLL-BISI-TRANS-22062-(9022.06)] N85-28723
Echo-response from crack-like two-dimensional reflectors in focused ultrasonic fields N85-28724
Ultrasonic crack tip method for the determination of crack depth N85-28725
ULTRASONIC RADIATION
Acoustooptic pulse-echo transducer system [NASA-CR-175919] N85-28224
ULTRASONIC SCANNERS
Measurement of ultrasonic fields in transparent media using a scanning differential interferometer [NASA-CR-175921] N85-28726
ULTRASONIC WELDING
Non-destructive testing of HF-welded pipe [BLL-BISI-TRANS-22182-(9022.06)] N85-28388
ULTRAVIOLET RADIATION
Evaluation of pyrotechnic fire suppression system for six pyrotechnic compositions [AD-A152995] N85-28130
UNITED STATES
Potential climatic impacts of increasing atmospheric CO2 with emphasis on water availability and hydrology in the United States [NASA-TM-87479] N85-28517
Close encounters with S/T (science and technology) in the Soviet Union [AD-P004570] N85-28864
Experimental philosophy leading to a small scale digital data base of the conterminous United States for designing experiments with remotely sensed data [NASA-TM-85009] N85-28877
UNSTEADY FLOW
Background noise measurements from jet exit vanes designed to reduced flow pulsations in an open-jet wind tunnel [NASA-TM-86383] N85-27916
Unsteady flow in multistage turbines N85-27946
New facility to study unsteady wake effects on turbine airfoil heat transfer N85-27948
UPLINKING
The IRAS end-to-end data system [NLR-MP-83056-U] N85-28883
UPPER ATMOSPHERE
Homogeneous processes of atmospheric interest [NASA-CR-175770] N85-28475
URBAN RESEARCH
Urban vehicle research project [DE85-005444] N85-28889
USER MANUALS (COMPUTER PROGRAMS)
Users manual for coordinate generation code CRDSRA [NASA-CR-172584] N85-27824
User's manual for airfoil flow field computer code SRAIR [NASA-CR-172585] N85-27825
Airport and airway system cost allocation model. Volume 7: User's manual [AD-A152877] N85-27917
FLOWPLOT 2: A fluid dynamics and heat transfer plotting package [DE85-009802] N85-28277
Documentation of PHOTO: A user's manual for the analysis of photographic and X-ray negatives [AD-A152988] N85-28327
COSMIC Software Catalog, 1985 edition [NASA-CR-174070] N85-28608
Real-Time Multiprocessor Programming Language (RTMPL) user's manual [NASA-TP-2422] N85-28810
VULTURE manual [DE85-008873] N85-28831
USER REQUIREMENTS
Further development of high voltage SIPMOS FET's to fulfill market needs [BMFT-FB-T-84-255] N85-28843

V

VACCINES
Progress, goals in biotechnology summarized N85-28182
VACUUM PUMPS
Impurity control and vacuum pumping system design and analysis for next-generation Tokamaks [DE85-009291] N85-28815
VACUUM TUBES
Laser welder for fabricating neutron tubes [DE85-009965] N85-28377
VALLEYS
The rifted margin of Saudi Arabia N85-28483
VALVES
Fracture mechanics analysis of cold drawn Si-Cr valve steel [BLL-BISI-TRANS-22216-(9022.06)] N85-28405
VANADIUM
Thermodynamic analysis of the plasma nitriding of ferrovanadium [BLL-BISI-TRANS-22237-(9022.06)] N85-28032
VANADIUM ALLOYS
Effects of the phase compositions of cast low-pearlite steels micro-alloyed with vanadium and titanium of their structure and properties [BLL-BISI-TRANS-22301-(9022.06)] N85-28067
The disordering process in an L12 ordered alloy [DE85-008152] N85-28093
VAPOR DEPOSITION
Morphology of GaAs/sub 1-x/P/sub x/ superlattices grown by MOCVD and chloride VPE [DE85-002944] N85-28842
VAPOR PHASE EPITAXY
Morphological stability and fluid dynamics of vapor crystal growth [NASA-CR-175879] N85-28822
Morphological stability and fluid dynamics of vapor crystal growth [NASA-CR-175880] N85-28823
VAPOR PHASES
Research on the kinetics of phase changes in solids [AD-A152387] N85-27989
Gas phase ion-molecule chemistry of carbon, nitrogen and oxygen compounds [AD-A152876] N85-27996
The decomposition of gas phase formaldehyde by plasma discharge [AD-A153202] N85-28007
VAPORS
Performance of an active/passive hybrid solar system utilizing vapor transport [DE85-008627] N85-28486
VARIABLE GEOMETRY STRUCTURES
Stability of cylindrical shells with variable thickness under external pressure N85-28164
VARIATIONS
Probabilistic finite element: Variational theory N85-27957
VARISTORS
Effects of processing chemistry on electrical properties of high field ZnO varistors [DE85-007688] N85-28254
VEGETATION
Airphoto interpretation of vegetation and landforms for soil mapping N85-28436
VELOCITY DISTRIBUTION
Feasibility of mapping velocity flow fields in SSME powerhead by laser anemometry techniques N85-27971
VELOCITY MEASUREMENT
Method of calculating separation flow of subsonic gas stream around wings N85-28161

Apparatus for measuring velocity of sound in fluids
N85-28175

VERBAL COMMUNICATION
Verbal information processing paradigms: A review of theory and methods
[AD-A153229] N85-28880

VERTICAL JUNCTION SOLAR CELLS
Apparatus for etching vertical junction solar cell wafers
[AD-D011653] N85-28443

VERTICAL TAKEOFF AIRCRAFT
Analysis of control system from a viewpoint of desired pole placement and desired degree of robustness
[AD-A152627] N85-27876

VERY LARGE SCALE INTEGRATION
VLSI workshop and project: February - November 1982
[WSRL-0374-TR] N85-28223
Restructurable VLSI (Very large scale integration) program
[AD-A152340] N85-28226
Efficient VLSI (Very Large Scale Integration) fault simulation
[AD-A152661] N85-28233
VLSI (Very large scale integrated circuits) device reliability models
[AD-A153268] N85-28245
Speed-up techniques for complementary metal oxide semiconductor very large scale integration
[AD-A152466] N85-28629

VERY LONG BASE INTERFEROMETRY
Precise time transfer using MKIII VLBI technology
N85-28310

VHSIC (CIRCUITS)
VLSI (Very large scale integrated circuits) device reliability models
[AD-A153268] N85-28245

VIBRATION
Natural vibrations of reinforced spherical shells
N85-28165
DOE/ANL/HTRI heat exchanger tube vibration data bank: Addendum 5
[DE85-007730] N85-28425
Telescoping low vibration pulling mechanism for Czochralski crystal growth
[AD-D011655] N85-28836

VIBRATION DAMPING
A study of internal and distributed damping for vibrating turbomachiner blades
[NASA-CR-175901] N85-27868
Stressed-strained state of tightening buckles in sectional runners of gas turbines N85-28149
Continuum modeling of latticed structures
N85-28399

VIBRATION EFFECTS
Flow-induced vibration of SSME main injector liquid-oxygen posts N85-27951
Vibrations of rotors connected through couplings with backlash N85-28147
Stressed-strained state of tightening buckles in sectional runners of gas turbines N85-28149

VIBRATION TESTS
Vibrations of rotors connected through couplings with backlash N85-28147

VIBRATIONAL SPECTRA
Vibrational spectra of a-Fe(.78)P(.22) by inelastic neutron scattering
[DE85-008298] N85-28016

VISCOELASTICITY
Vortices in non-Newtonian fluids
[AD-A153169] N85-28269

VISCOSITY
Aerodynamic performance of a wing in ground effect using the PANAIR program
[AD-A153303] N85-27832
Evaluation of used crankcase oils using computerized infrared spectrometry
[AD-A152993] N85-27999

VISCOUS FLOW
Proceedings of the 9th US Air Force and the Federal Republic of Germany Data Exchange Agreement Meeting, Viscous and Interacting Flow Field Effects
[AD-A153020] N85-28266
A second-order pressure-correction method for viscous incompressible flow
[REPT-84-15] N85-28280

VISIBILITY
Quality assurance for RESOLVE (Research on Operations-Limiting Visual Extinction). A visibility study in the California desert
[AD-A152383] N85-28494

VISUAL PERCEPTION
Perception of roll rate from an artificial horizon and peripheral displays
[VTH-LR-403] N85-28557

VOCODERS
The design of an adaptive predictive coder using a single-chip digital signal processor
[AD-A152461] N85-28231

VOICE COMMUNICATION
Wideband integrated voice/data technology
[AD-A152329] N85-28197
Oral discussion, group-to-individual transfer and achievement in cooperative learning groups
[AD-A153209] N85-26552

VOICE CONTROL
Wideband integrated voice/data technology
[AD-A152329] N85-28197

VOICE DATA PROCESSING
Wideband integrated voice/data technology
[AD-A152329] N85-28197

VOLT-AMPERE CHARACTERISTICS
Pressed boride cathodes
[NASA-TM-77821] N85-27984

VOLTAGE REGULATORS
Spark gap electrode erosion
[AD-A152802] N85-28237

VORTEX BREAKDOWN
An introduction to vortex breakdown and vortex core bursting
[NAE-AN-28] N85-27829

VORTICES
An experimental investigation of a turbulent junction vortex
[NASA-CR-175915] N85-28259
Vortices in non-Newtonian fluids
[AD-A153169] N85-28269
The effect of the Benthic Boundary Layer on the physics of intense mesoscale eddies
[AD-A153193] N85-28270
Tidal rectification in lateral viscous boundary layers of a semienclosed basin
[CWI-AM-R8415] N85-28284
Kinetic energy and vorticity of lee cyclones
[MITT-40] N85-28502

VULNERABILITY
Survivable ground base sensor
[AD-D011647] N85-28213

W

WAFERS
Uses of, experiences in production of custom designed IC's N85-28180

WALL FLOW
Adaptive wall wind tunnels and wall interference correction methods
[DFVLR-IB-222-84-A-37] N85-27912
Coherent structure reflective turbulent viscous flow modeling
[AD-A153086] N85-28267

WALL TEMPERATURE
Study of a constricted electric arc cooled by transpiration
[NASA-TM-77846] N85-28798

WALLS
Accelerator-based plasma-wall interaction studies on the TEXTOR Tokamak
[DE85-007540] N85-28806

WATER
Combustion and micro-explosion of water/oil emulsions in high pressure environments
[AD-A152960] N85-27997
Alternative heat sources for heat pumps
[DE85-007610] N85-28275
Inspection evaluation and repair of the flawed feedwater nozzle of the 50 MWe Dodewaard GKN boiling water reactor
[ISBN-90-353-0017-3] N85-28394
Potential climatic impacts of increasing atmospheric CO2 with emphasis on water availability and hydrology in the United States
[NASA-TM-87479] N85-28517

WATER FLOW
Tidal rectification in lateral viscous boundary layers of a semienclosed basin
[CWI-AM-R8415] N85-28284

WATER MANAGEMENT
Water quantity and quality research for the Rhine Meuse estuary
[PUBL-325] N85-28470

WATER POLLUTION
Limiting profiles in contaminant transport through porous media --- ground water pollution
[REPT-84-31] N85-28282

WATER QUALITY
Water quantity and quality research for the Rhine Meuse estuary
[PUBL-325] N85-28470

WATER RESOURCES
Water quantity and quality research for the Rhine Meuse estuary
[PUBL-325] N85-28470

WATER VAPOR
Experimental and theoretical study of condensation in multicomponent vapors
[DE85-009357] N85-28021
Water vapor radiometry research and development phase
[NASA-CR-175887] N85-28512

WAVE DIFFRACTION
An examination of the use of wave packets for the calculation of atom diffraction by surface
[AD-A152760] N85-28735

WAVE EQUATIONS
Scattering of sounds by piezoceramic cylindrical shell near rigid surface N85-28168

WAVE FRONT RECONSTRUCTION
Methods for design aerodynamics of modern transport aircraft
[DFVLR-FB-85-05] N85-27838

WAVE FRONTS
Stability of high energy particle plasmas to MHD-like modes
[DE85-007879] N85-28803

WAVE FUNCTIONS
The strategy for time dependent quantum mechanical calculations using a Gaussian wave packet representation of the wave function
[AD-A152709] N85-28845

WAVE PACKETS
An examination of the use of wave packets for the calculation of atom diffraction by surface
[AD-A152760] N85-28735
The strategy for time dependent quantum mechanical calculations using a Gaussian wave packet representation of the wave function
[AD-A152709] N85-28845

WAVE PROPAGATION
Propagation of non-axisymmetric elastic waves through shell with filler under radial load at one end N85-28169
Radiometer integrated into a communication terminal
[AD-A151746] N85-28195
A transport theory of millimeter wave propagation in woods and forests
[AD-A151883] N85-28196
The weighting function for scintillation on a folded path
[AD-A152659] N85-28206
A crustal section for the Arabian Shield and adjacent Red Sea margin derived from first-arrival data
N85-28480

WAVE REFLECTION
Kirchhoff modeling via wave equation datuming
[AD-A152399] N85-28727

WAVE SCATTERING
A transport theory of millimeter wave propagation in woods and forests
[AD-A151883] N85-28196
The temperature dependence of diffracted beam intensities in atom-surface scattering
[AD-A152762] N85-28736

WAVEGUIDES
Design of the waveguide for microwave heating of solid lithium ceramic blankets
[DE85-009776] N85-28120

WEAPON SYSTEMS
Presentations at the Tri-Service Cloud Modeling Workshop (2nd), held at the Naval Surface Weapons Center, White Oak, Maryland, 26-27 June 1984, volume 1
[AD-A152735] N85-28522
The Department of Defense statement on the Science and Technology Program by Colonel Donald I. Carter, USAF Acting Deputy Under Secretary of Defense for Research and Advanced Technology before the Subcommittee on Research and Development of the Committee on Armed Services of the United States House of Representatives, 99th Congress, first session
[AD-A152467] N85-28850
Soviet weapons development and the scientific community
[AD-P004562] N85-28857
The revolution in military affairs and the Soviet system
[AD-P004568] N85-28863

WEAPONS
A proportional-plus-integral controller for a particle beam weapon
[AD-A153213] N85-28778

WEAPONS DEVELOPMENT
Soviet weapons development and the scientific community
[AD-P004562] N85-28857

Technology and technical efficiency in the Soviet Union: Dominant patterns of constrained optimization in a noncompetitive economic regime
[AD-P004567] N85-28862

WEAR

Friction and wear behavior of aluminum and composite I-beam stiffened airplane skins
[NASA-TM-86418] N85-27852
Tribological sinks: Money down the drain
[DE85-010019] N85-28376

WEAR INHIBITORS

Lubricant and additive effects on spur gear fatigue life
[NASA-TM-87044] N85-28373

WEAR TESTS

Determination of wear intensity and resource of crankshafts and cylinder liners of ZIL-130 and ZMZ-53 engines
[BLL-BISI-TRANS-21393-(9022.06)] N85-28355
Examples of application of machinability tests
[BLL-BISI-TRANS-22346-(9022.06)] N85-28363
Lubricant and additive effects on spur gear fatigue life
[NASA-TM-87044] N85-28373

WEATHER

Flying in spite of the weather
[NLR-MP-84021-U] N85-27847
Air Weather Service (AWS) climatic briefs: Europe
[AD-A152528] N85-28519

WEATHER FORECASTING

Centralized Storm Information System (CSIS)
[NASA-CR-175898] N85-28506
A report from the Space Science and Engineering Center, the University of Wisconsin-Madison, Madison, Wisconsin N85-28507
Test and evaluation plan for the Centralized Storm Information System N85-28508
CSIS test and evaluation N85-28509
Functional and performance requirements of the next NOAA-Kasas City computer system N85-28510
Spectral decomposition and verification of NOGAPS 500MB medium-range forecasts
[AD-A152550] N85-28520
Weather radar studies
[AD-A152563] N85-28521
Airborne research meteorological data collected by the National Hurricane Research Laboratory (Hurricane Research Division/AOML) during the 1982-1983 hurricane seasons: Inventory and availability
[PB85-163681] N85-28528

WEIGHT INDICATORS

Effect of superconducting solenoid model cores on spanwise iron magnet roll control
[NASA-TM-86378] N85-27915

WEIGHTING FUNCTIONS

The weighting function for scintillation on a folded path
[AD-A152659] N85-28206
Fuzzy hierarchical analysis
[DE85-008149] N85-28685

WEIGHTLESSNESS

Free-surface phenomena under low- and zero-gravity conditions
[NASA-CR-175885] N85-27922

WELD STRENGTH

Local heat treatment of welded joints of pipes and rotary vessels
[BLL-BISI-TRANS-22197-(9022.06)] N85-28354
Technical information: Weldability of stainless steel. Part 1: Austenitic stainless steel
[BLL-BISI-TRANS-22456-(9022.06)] N85-28362

WELD TESTS

Local heat treatment of welded joints of pipes and rotary vessels
[BLL-BISI-TRANS-22197-(9022.06)] N85-28354
Statistical models used in analyzing the quality of welded tubes
[BLL-BISI-TRANS-22232-(9022.06)] N85-28384
Non-destructive testing of HF-welded pipe
[BLL-BISI-TRANS-22182-(9022.06)] N85-28388

WELDABILITY

Weldability of micro-alloy steels as reaction of structure and inclusions
[BLL-BISI-TRANS-22196-(9022.06)] N85-28027
High-strength weldable steel 03G4N2MAF Sh with improved ductility
[BLL-BISI-TRANS-22233-(9022.06)] N85-28031
Stainless steels: Application and welding
[BLL-BISI-TRANS-22357-(9022.06)] N85-28059
Welding of 11 458.1 steel in shielding atmospheres
[BLL-BISI-TRANS-21763-(9022.06)] N85-28353
Submerged arc welding of new Czechoslovak micro-alloy steels
[BLL-BISI-TRANS-22193-(9022.06)] N85-28356
Technical information: Weldability of stainless steel. Part 1: Austenitic stainless steel
[BLL-BISI-TRANS-22456-(9022.06)] N85-28362
Tests of low-cycle fatigue of elected steels of class 11
[BLL-BISI-TRANS-22039-(9022.06)] N85-28404

WELDED JOINTS

Local heat treatment of welded joints of pipes and rotary vessels N85-28028
Welding of 11 458.1 steel in shielding atmospheres
[BLL-BISI-TRANS-21763-(9022.06)] N85-28353
Local heat treatment of welded joints of pipes and rotary vessels
[BLL-BISI-TRANS-22197-(9022.06)] N85-28354
Formation of a fine structure during shock wave welding
[BLL-BISI-TRANS-22401-(9022.06)] N85-28368
Examination of the regions of the joint of sheets bonded by the explosive welding technique
[BLL-BISI-TRANS-22352-(9022.06)] N85-28370
Differential between crack and pseudo-crack indications by means of objective magnetic flux leakage testing
[BLL-BISI-TRANS-22033-(9022.06)] N85-28386
Inspection of welds and the factors improving its effectiveness in welded structure fabrication
[BLL-BISI-TRANS-22194-(9022.06)] N85-28387
Non-destructive testing of HF-welded pipe
[BLL-BISI-TRANS-22182-(9022.06)] N85-28388
The fatigue properties of welds at low temperature, according to the type of steel
[BLL-BISI-TRANS-22455-(9022.06)] N85-28410
Fatigue strength of Inconel 625 plate and weldments used in the DIII-D configuration vacuum vessel
[DE85-008276] N85-28427

WELDED STRUCTURES

Local heat treatment of welded joints of pipes and rotary vessels
[BLL-BISI-TRANS-22197-(9022.06)] N85-28354
Steel Tubes
[BLL-BISI-TRANS-22064-(9022.06)] N85-28369
Inspection of welds and the factors improving its effectiveness in welded structure fabrication
[BLL-BISI-TRANS-22194-(9022.06)] N85-28387

WELDING

The characteristic structure of weld metal of high temperature alloy X20CrMoV 121
[BLL-BISI-TRANS-21623-(9022.06)] N85-28069
Formation of a fine structure during shock wave welding
[BLL-BISI-TRANS-22401-(9022.06)] N85-28368
Principal quality assurance measures in the manufacture of HF-welded high-pressure linepipe
[BLL-BISI-TRANS-21690-(9022.06)] N85-28389
Fatigue crack propagation characteristics and fatigue fracture toughness in 780 MPa grade high strength steel weldments at low temperature
[BLL-BISI-TRANS-22369-(9022.06)] N85-28411

WELDING MACHINES

Laser welder for fabricating neutron tubes
[DE85-009965] N85-28377

WEST GERMANY

Proceedings of the 9th US Air Force and the Federal Republic of Germany Data Exchange Agreement Meeting, Viscous and Interacting Flow Field Effects
[AD-A153020] N85-28266
Investigation of air pollution impact in Eastern Bavaria: Measurement results from August and September, 1984
[DFVLR-FB-85-03] N85-28471
Documentation for the West German Federal Cabinet's space policy decision N85-28886

WHEELS

Assessing the machinability of gearwheel steels during manufacture
[BLL-BISI-TRANS-22343-(9902.06)] N85-28365

WHITE NOISE

On the probability density of signal-to-noise ratio in an improved detector
[AD-A152529] N85-28232

WIND EFFECTS

On the wind-induced vibrations of a mass-spring system
[REPT-84-04] N85-28428

WIND TUNNEL APPARATUS

Construction 1976-1980: Design, manufacturing, calibration of the German-Dutch wind tunnel (DNW) N85-27913
Effect of superconducting solenoid model cores on spanwise iron magnet roll control
[NASA-TM-86378] N85-27915

WIND TUNNEL MODELS

The application of numerical control (NC) in manufacturing wind tunnel models
[B8580078] N85-28140
Analysis of heat-transfer measurements from 2 AEDC wind tunnels on the Shuttle external tank
[NASA-CR-171470] N85-28263
Heating parameter estimation using coaxial thermocouple gages in wind tunnel test articles
[AD-A153039] N85-28328

WIND TUNNEL TESTS

Wing tunnel investigation of dynamic stall of an NACA 0018 airfoil oscillating in pitch
[NAE-AN-27] N85-27830
Design of a basic profile for a low sweep airfoil. Part 2: Experimental investigation on the DFVLR-W1 airfoil profile in the Brunswick transonic wind tunnel
[DFVLR-FB-85-01-PT-2] N85-27833
Rotorcraft research testing in the National Full-Scale Aerodynamics Complex at NASA Ames Research Center
[NASA-TM-86687] N85-27854
Wing buffeting active control testing on a transport aircraft configuration in a large sonic windtunnel N85-27903
Background noise measurements from jet exit vanes designed to reduced flow pulsations in an open-jet wind tunnel
[NASA-TM-86383] N85-27916
The gust simulation apparatus of the 3m x 3m low speed wind tunnel of the DFVLR in Goettingen, West Germany
[DFVLR-FB-85-04] N85-27920
Analysis of heat-transfer measurements from 2 AEDC wind tunnels on the Shuttle external tank
[NASA-CR-171470] N85-28263
Heating parameter estimation using coaxial thermocouple gages in wind tunnel test articles
[AD-A153039] N85-28328

WIND TUNNEL WALLS

Adaptive wall wind tunnels and wall interference correction methods
[DFVLR-IB-222-84-A-37] N85-27912

WIND TURBINES

Wind energy systems: Program summary for fiscal year, 1983
[DE85-002927] N85-28451
Field test report of the Department of Energy's 100-kW vertical axis wind turbine
[DE85-008475] N85-28458
A 5-year research plan, 1985-1990. Wind energy technology: Generating power from the wind
[DE85-008427] N85-28463

WINDPOWER UTILIZATION

Wind energy systems: Program summary for fiscal year, 1983
[DE85-002927] N85-28451
Field test report of the Department of Energy's 100-kW vertical axis wind turbine
[DE85-008475] N85-28458
A 5-year research plan, 1985-1990. Wind energy technology: Generating power from the wind
[DE85-008427] N85-28463

WINDPOWERED GENERATORS

Field test report of the Department of Energy's 100-kW vertical axis wind turbine
[DE85-008475] N85-28458

WING CAMBER

Automatic flight control modes for the AFTI/F-111 mission adaptive wing aircraft N85-27909

WING OSCILLATIONS

Propulsion efficiency of vibrating bodies in subsonic gas stream N85-28159

WING PLANFORMS

Supersonic aerodynamic characteristics of canard, tailless, and aft-tail configurations for 2 wing planforms
[NASA-TP-2434] N85-27822
Some effects of sweep direction and strakes for wings with sharp leading edges
[CA-8421] N85-27826
A method to calculate the parameters of wings of arbitrary planform
[AD-A152689] N85-27831

WINGS

Wing buffeting active control testing on a transport aircraft configuration in a large sonic windtunnel N85-27903
Method of calculating separation flow of subsonic gas stream around wings N85-28161

WIRE

Research on design of cryotransformers and its prospects for the future
[AD-A152400] N85-28230

WORK

Computing environments for data analysis. Part 1: Introduction
[DE85-007919] N85-28603
Computing environments for data analysis. Part 2: Hardware
[DE85-008320] N85-28604

WORK CAPACITY

The relationship between performance and satisfaction: A utility analysis
[AD-A152342] N85-28548

WORKLOADS (PSYCHOPHYSIOLOGY)

Aspects of application of ACT systems for pilot workload alleviation N85-27887

The relationship between performance and satisfaction: A utility analysis
[AD-A152342] N85-28546

X

X RAY ANALYSIS
East Europe report: Science and technology
[JPRS-ESA-85-017] N85-28177
Proton induced X-ray emission method, its application in analytics N85-28178
Cosmic X-ray physics
[NASA-CR-175908] N85-28910
X RAY ASTRONOMY
Observation of the Crab nebula in the hard X-ray
[MPE-186] N85-28897
X RAY DIFFRACTION
X-ray crystallography of steel U8 after pulsed laser hardening
[BLL-BISI-22444-(9022.06)] N85-28038
X-ray diffraction study of changes in stress-strain distributions during fatigue of a 2-phase alloy
[AD-A152367] N85-28067
An X-ray diffraction study of the residual stress-strain distribution in shot-peened 2-phase brass
[AD-A152418] N85-28068
The synthesis and structure of polyphosphazenes
[AD-A153134] N85-28112
Properties of defects in Hg(1-x)Cd(x)Te
[AD-A153243] N85-28835
X RAY IMAGERY
Documentation of PHOTO: A user's manual for the analysis of photographic and X-ray negatives
[AD-A152988] N85-28327
X RAY SOURCES
Optical observations of HEAO-B objects N85-28895
X RAY SPECTRA
X-ray emission and the winds of cataclysmic variables
[DE85-007663] N85-28902
The solar coronal X-ray spectrum 5.5-12 A
[AD-A152334] N85-28908
X RAY SPECTROSCOPY
Cosmic X-ray physics
[NASA-CR-175908] N85-28910
X RAYS
Documentation of PHOTO: A user's manual for the analysis of photographic and X-ray negatives
[AD-A152988] N85-28327

Y

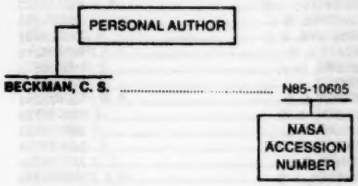
YAG LASERS
Design and construction of a CW ND:YAG laser using a single elliptical cavity and water cooled krypton arc lamp pumping
[AD-A152657] N85-28340
YIELD STRENGTH
The Mises yield condition for thin rotationally symmetric shells
[BLL-BISI-TRANS-22047-(9022.06)] N85-28409

Z

ZEOLITES
Correlation of zeolite ZSM-5 acid strength with catalytic activity and selectivity
[DE85-005415] N85-28013
High resolution powder diffraction
[DE85-006287] N85-28015
ZINC ALLOYS
Thermal expansion effects in electrical transport in amorphous metals
[AD-A152477] N85-28089
ZINC CHLORIDES
Transport in aqueous battery systems
[DE85-007246] N85-28251
ZINC COMPOUNDS
Properties of chromate coatings formed on electrolytic zinc substrates
[BLL-BISI-TRANS-22349-(9022.06)] N85-28052
ZINC OXIDES
Effects of processing chemistry on electrical properties of high field ZnO varistors
[DE85-007688] N85-28254
ZINC-CHLORINE BATTERIES
Baseline cycle testing of a 500-kWh zinc chloride battery at the Battery Energy Storage Test (BEST) Facility
[DE85-006948] N85-28249
Transport in aqueous battery systems
[DE85-007246] N85-28251
ZIRCONIUM
Characterization of the fatigue and slow crack growth behavior of partially stabilized zirconia ceramics
[DE85-005240] N85-28113
ZIRCONIUM OXIDES
Fracture toughness of MgCr(sub)2O(sub)4-ZrO(sub)2
[DE85-007945] N85-27982
Indirect brazing of structural ceramics for uncooled diesels
[DE85-005569] N85-28116
Microstructure-mechanical property relationships in transformation-toughened ceramics
[DE85-009722] N85-28117

PERSONAL AUTHOR INDEX

Typical Personal Author Index Listing



Listings in this index are arranged alphabetically by personal author. The NASA accession number denotes the number by which the citation is identified.

A

AAKJAER, P. N85-28515
ABBINK, F. J. N85-27847
ABOUTORABI, M. R. N85-28424
ABRATE, S. N85-28399
ADAMCZYK, J. J. N85-27945
ADAMS, T. F. N85-28684
ADDISON, J. H., JR. N85-28375
ADLAKHA, V. G. N85-28710
ADRIAANSE, M. N85-28470
AHERN N85-28273
AIKENS, D. A. N85-27990
AIKENS, R. S. N85-28238
ALDRED, W. N85-28248
ALEXANDER, A. J. N85-28857
ALEXANDER, M. H. N85-28833
ALI, A. I. N85-28709
ALIMOV, V. I. N85-28054
ALLAN, D. W. N85-28289
N85-28290
N85-28295
N85-28311
ALLCOCK, H. R. N85-28112
ALLEN, D. K. N85-28616
ALYMOV, A. A. N85-28042
AMELL, M. F. N85-28626
AMERI, A. N85-27947
AMHOLS, C. A. N85-28528
AMICO, R. L. N85-28911
AN, B. G. N85-28206
ANDERSON, D. C. N85-27888
ANDERSON, D. P. N85-28327
ANDERSON, N. J. N85-28023
ANDERSON, O. L. N85-27950
ANDERSON, W. R. N85-27993
ANDREEVA, G. S. N85-28078
ANNOVAZZI, I. N85-28061
ANSORGE, J. N85-28477
ANTHONY, R. W. N85-28509
ANTOLOVICH, S. D. N85-27964
N85-27965
ANTON, D. L. N85-27966
ANTSIFEROV, V. N. N85-28050
AOKI, S. N85-28293
APELIAN, D. N85-28600
APOSTOLOV, L. A. N85-28360
ARAI, M. N85-28016
ARBOCZ, J. N85-28429
ARDUINI, R. F. N85-28513
ARKHANGELSKII, V. M. N85-28060
ARMITAGE, D. N85-28790
ARPASI, D. J. N85-28610
ASARO, R. J. N85-28420
ASATIANI, G. N. N85-28041
ASCARELLI, G. N85-28840
ASHJAEE, J. M. N85-28297
AUBRY, J. P. N85-28319
AZEVEDO, S. G. N85-28601

B

BAART, M. L. N85-28590
BABIS, J. S. N85-28343
BACK, B. B. N85-28751
BACKUS, C. E. N85-28464
BAGGETT, N. N85-28348
BAHLER, D. N85-28585
BAHLMANN, W. N85-28383
BAHRAMI, M. N85-28826
N85-28827
BAILEY, M. J. N85-28576
BAIWEI, Z. N85-28066
BAJAJ, J. N85-28835
BAKER, A. J. N85-28659
BAKER, C. L. N85-27967
BAKER, F. T. N85-28619
BAKKER, P. G. N85-27835
N85-28278
BAKUMENKO, I. K. N85-28149
BALDAUF, M. F. N85-28542
BALIGA, B. J. N85-28226
BALL, B. W. N85-28329
BALLMANN, J. S. N85-28211
BALLUFFI, R. W. N85-28099
BANDA, E. N85-28477
BANDY, R. N85-28095
BANE, K. L. F. N85-28750
BANERJEE, P. N85-28323
BANGERTER, R. O. N85-28767
BANNINK, W. J. N85-27835
BARAZ, V. R. N85-28406
BARBER, E. M. N85-27831
BARBIER, K. M. N85-28512
BARDEEN, W. A. N85-28745
BARENDRECHT, E. N85-28025
N85-28026
BARKER, J. R. N85-28475
BARNABY, B. E. N85-28377
BARNES, J. A. N85-28316
BARNETT, R. M. N85-28773
BARNHILL, R. E. N85-28567
BARSKY, B. A. N85-28579
BARTZ, D. N85-28276
BASHNIN, Y. A. N85-28412
BASILI, V. R. N85-28619
BATCHMAN, T. E. N85-28785
BATTAT, M. E. N85-28812
BAUER, E. N85-28522
BECHER, P. F. N85-28113
BEECH, W. E. N85-28242
BEESTON, J. M. N85-28811
BEIER, K. N85-28442
BEIJERS, A. P. A. M. N85-28394
BEJCZY, A. K. N85-28559
BELIKOV, V. N85-27842
BELOSEVICH, V. K. N85-28360
BELOTSERKOVSKIY, S. M. N85-28161
BELTRAN, G. N. N85-28877
BELYTSCHKO, T. N85-27957
BEN-TAL, A. N85-28713
BENDA, B. J. N85-27855
N85-27856
BENSHTEIN, L. I. N85-28067
BENSON, S. W. N85-28004
BENZ, H. N85-28477
BERENS, A. P. N85-27858
BERENSTEIN, C. N85-28672
BERENSTEIN, C. A. N85-28660
BERGSTRA, J. A. N85-28214
N85-28638
BERI, A. C. N85-28344
BERK, H. L. N85-28803
BERNARD, C. E. N85-28647
BERNARD, E. N85-28845
BERNSHTEIN, M. L. N85-28078
BERNSTEIN, S. M. N85-27967
BERSTEIN, M. L. N85-28063
BERTHEL, R. O. N85-28505
BERTSCH, G. N85-28747
BESJES, J. G. N85-28281
BETHKE, K. H. N85-28217
BEUHLER, R. J. N85-28769
BEURRIER, D. N85-27906
BEUVY, G. N85-28318
BIERBAUM, V. M. N85-27996
BIRSE, M. C. N85-28761
BITTNER, A. C., JR. N85-28543
BIZON, P. T. N85-27961
BLAKESLEE, A. E. N85-28642
BLAUT, M. N85-28079
BLECHA, M. N85-28125
N85-28126
BLINOV, V. N. N85-28078
BLINOVSKII, V. A. N85-28051
BOCK, R. F. N85-28199
BODEN, A. N85-28258
BOEDER, H. N85-27874
BOEHM, W. N85-28566
BOEHRET, H. N85-27897
BOERCHERS, H. N85-27918
N85-27919
BONGENAAR-SCHLENTER, B. E. N85-28025
BOOTH-KEWLEY, S. N85-28670
BORDEN, C. S. N85-28446
BORJA, M. R. N85-27938
BORREGO, J. H. N85-28377
BOSANSKY, J. N85-28027
BOST, D. E. N85-28881
BOTT, J. F. N85-28011
BOUKH, L. V. N85-28076
BOUSACK, H. N85-28141
BOWYER, J. M., JR. N85-28449
BOYD, L. S. N85-28372
BRACKBILL, J. U. N85-28804
BRADLEY, R. C. N85-28666
BRAEUNIG, D. N85-28258
BRAGER, H. R. N85-28094
BRASKI, D. N. N85-28335
BREEMAN, J. H. N85-27860
BRESSING, A. N85-27918
N85-27919
BREWER, D. J. N85-28646
BRIAN, B. W. N85-28014
BRIDGES, D. E. N85-28598
BRITAN, A. B. N85-28156
BRITCHER, C. P. N85-27915
BRODERICK, P. W. N85-28877
BRODSKY, S. J. N85-28742
N85-28779
BROKMAN, A. N85-28099
BRONSVOORT, W. F. N85-28636
BROOKS, J. N. N85-28810
BROOKS, T. L. N85-28559
BROWN, M. N85-28390
BROWN, R. G. N85-28313
BROWN, V. L. N85-27932
N85-28911
BROWN, W. J. N85-28528
BRUCE, A. M. N85-28770
BRUNO, A. N85-28357
BRYANT, M. P. N85-28537
BUCKINGHAM, S. L. N85-27890
BUCKLEW, J. A. N85-28702
BUCKLEY, J. J. N85-28685
BUCZYNSKI, P. S. N85-28234
BUIGE, A. N85-28199
BUISSON, J. A. N85-28298
N85-28299
N85-28303
N85-28310
BUKHBINDER, I. A. N85-28360
BUMROONGPOL, S. N85-28205
BUNTE, S. W. N85-27993
BURBACH, T. N85-28262
BURCHARDT, W. N85-28336
BURKETT, S. T. N85-28340
BURLINSON, N. E. N85-28005
BURNS, C. J. N85-28498
BURNSIDE, O. H. N85-27955
BURRAGE, R. G. N85-27904
BURTON, R. A. N85-27898
BUTLER, J. K. N85-28345
BUTLER, R. W. N85-28644
BYKADOROV, A. T. N85-28043

C

CAHN, R. N. N85-28773
CAHOON, N. T. N85-28328
CALLAWAY, J. N85-28740
CALLEN, J. D. N85-28816
CALTAGIRONE, J. N85-28130
CAMBANIS, S. N85-28702
CAMPBELL, C. W. N85-28656
N85-28708
CAMPBELL, M. F. N85-28899
CARL, W. C. N85-28889
CARLE, W. E. N85-28509
CARLSON, R. E. N85-28683
CARLSON, R. L. N85-27959
CARPENTER, J. M. N85-28016
CARR, D. B. N85-28600
CARRIER, G. F. N85-28138
CARROLL, R. G. N85-27865
CARROLL, W. E. N85-28014
CARSON, R. F. N85-28785
CARTER, D. I. N85-28850
CARTER, R. C. N85-28543
CASASENT, D. N85-28658
CASH, S. E. N85-27932
CAVE, J. A. K. N85-28662
CELESTINA, M. L. N85-27945
CHAGANTY, N. R. N85-28831
CHALOUD, D. N85-28494
CHAMIS, C. C. N85-27952
N85-27978
CHANDLEE, R. C. N85-28512
CHANG, J. N85-27876
CHANG, S. N85-28562
CHANUT, F. N85-28185
CHARNES, A. N85-28713
CHASTAIN, G. C. N85-28878
CHATURVEDI, P. N85-28497
CHAUDHRY, Z. A. N85-27960
CHAVEZ, M. C. N85-28512
CHEILYAKH, A. P. N85-28071
CHEN, C. L. N85-27828
CHEN, J. N85-28497
CHEN, N. C. J. N85-28457
CHEN, P. C. T. N85-28424
CHEN, S. S. N85-27951
CHEN, Z. N85-28248
CHENE, J. N85-27967
CHENOWETH, J. M. N85-28425
CHIDSEY, C. E. D. N85-27998
CHILTON, B. N85-28542
CHIN, J. N85-27889
CHIRIKHINA, S. L. N85-28042
CHKHIKVADZE, T. D. N85-28175
CHMELA, J. N85-28049
CHOK, M. B. N85-28617
CHOPLIN, J. N85-27906
CHOTTINER, G. S. N85-28017
CHOW, C. Y. N85-27828
CHOW, T. P. N85-27987
N85-28228
CHUNG, Y. W. N85-27988
CHURCHILL, P. N. N85-28294
CIALONE, H. J. N85-28101
CIESLA, W. N85-28052
CILEN, N. N85-28014
CITURS, K. D. N85-27878
N85-27879
CIVERA, M. N85-28359
CLARK, A. L. N85-28586
CLARK, C. W. N85-28018
CLARK, T. A. N85-28310
CLARKE, B. R. N85-28666
CLARKE, R. T. N85-28309
CLAUS, J. N85-28348
CLAUS, R. O. N85-28224
N85-28726
CLEMENTS, P. A. N85-28294
CLEMONS, J. M. N85-28107
CLIFTON, R. J. N85-28420
CLOTHIAUX, E. J. N85-28007
COATES, J. P. N85-27999
N85-28000
COBB, C. K. N85-28277
COEHNE, U. N85-28386
COFFER, J. N85-28011
COHEN, B. I. N85-28608
COHEN, D. S. N85-28846
COHEN, J. B. N85-28087
N85-28088
COHEN, L. N85-28649
COHEN, L. M. N85-28138
COIT, D. N85-28245
COLE, E. O. N85-28784
COLEMAN, J. J. N85-28244
COLEMAN, J. O. N85-28208
COLEMAN, L. W. N85-28334
COLEMAN, P. D. N85-28755
COLEMAN, R. V. N85-28768
COLEMAN, T. F. N85-28629
COMBI, M. R. N85-28904
CONE, M. V. N85-28542
CONEY, P. J. N85-28501
COOK, K. H. N85-28525
COOL, R. L. N85-28749
COOPER, J. F. N85-28456
N85-28839
COOPER, L. N. N85-28554
CORBETT, J. D. N85-28837
CORDARA, D. N85-28299
CORDOVA, F. A. N85-28902
COTE, P. J. N85-28089
COURANT, E. D. N85-28766
COVELL, P. F. N85-27822
COX, D. E. N85-28015
COX, D. P. N85-28910
CRANDALL, S. H. N85-28426
CROCETTI, C. P. N85-28851
CSONKA, P. I. N85-28758
CUVELIER, C. N85-28263

D

DACHEL, P. N85-28299
N85-28303
N85-28320
DAGDIGIAN, P. J. N85-28833
DALABA, E. M. N85-28128
DALEY, E. N85-27893
DANDREA, J. F. N85-28006
DANIEL, S. R. N85-28127
DANIELS, J. G. N85-28107
DANLY, B. G. N85-28754
DAS, P. N85-27994
DASGUPTA, A. N85-28093
DATZ, S. N85-28743
DAVID, S. A. N85-28116
DAVIDSON, J. W. N85-28812
DAVIDUK, N. N85-28133
DAVIS, C. S. N85-28704
DAVIS, W. J. N85-27898
DAWSON, P. R. N85-28630
DAWSON, S. R. N85-28218
DE, S. N85-28401
DEBAISIEUX, A. N85-28319
DEBAKKER, J. W. N85-28639
DEBENEDETTI, B. N85-28053
DEBROY, T. N85-28378
DECAUDIN N85-27918
N85-27919
DEFARIA, M. M. N85-28613
DEGRAAF, J. M. N85-28282
DEJONG, H. F. N85-28102
DEKKING, F. M. N85-28691
DELOSME, J. M. N85-28661
DEMELO, S. F. J. N85-28640
DEMONTAUDOUIN, Y. N85-28591
DEMYANOVSKAYA, Z. V. N85-28055
DENHAM, D. N85-28473
DENSON, W. N85-28245
DENTON, M. B. N85-28009
N85-28238
N85-28343
DEPAGTER, B. N85-28688
DEPUY, C. H. N85-27996
DERGANOV, B. S. N85-28136
DEROSE, T. D. N85-28579
DESMARAIS, L. A. N85-28129
DESTUYNDER, R. N85-27903
DESWART, H. E. N85-28284
DETOMA, E. N85-28299
N85-28303
DEUTSCH, V. N85-28395
DEVANEY, K. W. N85-28597
DEVORE, C. R. N85-28801
DEWITT, L. C. N85-28599
DEWOLF, D. A. N85-28271
DHEIN, R. N85-28124
DICK, G. J. N85-28324
DICK, J. W. N85-27855
N85-27856
DICKUS, R. A. N85-28325
DIETRICH, R. N85-28434
DIETZMANN, H. E. N85-28374
DIJKHUIS, B. N85-28848
DIPIPPO, R. N85-28453
DISSANAYAKE, A. W. N85-28527
DOBMANN, G. N85-28386
DOCKERY, G. D. N85-28726
DOLEZAL, F. A. N85-28342
DOLIN, R. M. N85-28573
DOLINA, I. S. N85-28157
DORONIN, G. I. N85-28058
DORONKIN, K. Y. N85-28037
DOROSHEV, V. D. N85-28171
DORST, N. M. N85-28528
DOSCH, R. G. N85-28254
DOSCHEK, G. A. N85-28908
DOSS, K. G. R. N85-28752
DRAKE, J. N85-28497
DRAPATZ, S. N85-28899
DRAZIN, R. N85-28853
N85-28854
DRESNER, L. N85-28838
DRIESSSEN, J. M. N85-28283
DRIGGANS, R. L. N85-28253
DRONKERS, J. J. N85-28392
DUCATI, A. C. N85-28219
DUDZIAK, D. J. N85-28812
DUFFY, J. N85-28420
DUFOUR, L. B. N85-28394
DUNCAN, M. M. N85-28739
DUNLAP, H. L. N85-28832
DUNN, M. G. N85-27949
DUNN, R. E. N85-28204
DUNSTAN, J. O. N85-27939
DURSO, S. N85-28011
DUTTA, J. M. N85-28331
DUX, P. F. N85-28413
DWORAK, H. P. N85-28307
DYBDAL, R. B. N85-28195
DYJA, H. N85-28370
DZIADON, A. N85-28029
DZIMIANSKI, J. W. N85-28243
DZNELADZE, Z. I. N85-28081

E

EASTMAN, T. E. N85-28496
EASTWOOD, G. H. N85-28239
ECKERT, E. R. G. N85-28798
EDNERAL, N. V. N85-28057
EDWARDS, A. N85-28534
EHST, D. A. N85-28810
EIMERS, E. N85-28124
EL-AASSER, M. S. N85-28108
ELGERED, G. N85-28310
ELLIS, J. F. N85-28721
ELMAN, H. C. N85-28671
EMERY, J. D. N85-28571
EMMITT, G. D. N85-28511
ENGEMAN, D. N85-28467
ENGLUND, D. R. N85-27968
ENK, J. O. N85-28209
EPPERSON, P. M. N85-28238
ERDELYI, J. N85-28181
ERIKLINTSEV, V. V. N85-28136
N85-28364
ERININ, K. N85-28064
ESCALLIER, E. A. N85-28218
EVANS, J. E. N85-28521
EVANS, M. R. N85-27909
EXARHOS, G. J. N85-28351
EYRAUD, M. Y. N85-28547

F

FARAKHUTDINOVA, M. A. N85-28154
FARIN, G. N85-28577
FARRELL, P. A. N85-27859
FARRIS, R. J. N85-27979
FASSETT, J. D. N85-28018
FAY, T. H. N85-28563
FAZYLOV, A. R. N85-28170
FEENEY, P. N85-28494
FELDBUSH, V. I. N85-28152
FELDMAN, U. N85-28908
FENDELL, F. E. N85-28138
FENDLEY, P. N85-28120
FENNELL, J. F. N85-28492
FERBER, H. N85-27874
FERBER, M. K. N85-28113
FERGUSON, D. R. N85-28585
FERGUSON, T. V. N85-27971
FERNOW, R. N85-28348
FERRANTE, J. N85-28099
FERRAUDI, G. N85-28022
FICKENSCHER, G. N85-28614
FIERRO, C. N85-28248
FIETZ, W. A. N85-28721
FILLER, R. L. N85-28322
FINE, D. A. N85-28325
FINKEL, R. A. N85-28648
FINNEY, B. R. N85-27925

FINUCANE, R. G. N85-28349
FIORE, A. W. N85-28266
FIRBAS, P. N85-28478
FIRRAO, D. N85-28053
FISCHER, T. R. N85-28667
FISHER, C. D. N85-28546
N85-28548
FJODOROV, V. N. N85-28047
FLATOW, D. N85-28133
FLEETER, R. D. N85-28138
FLEMINGS, M. C. N85-28800
FLETCHER, G. Y. N85-28575
FLEYSHMAN, N. P. N85-28163
FLIEGEL, H. F. N85-28301
FLINT, S. N85-28245
FLUEH, E. R. N85-28484
FONTANA, J. J. N85-28114
FOOSE, V. E. N85-28199
FORSTER, F. N85-28382
FORSYTH, D. A. N85-28479
FORTUIN, L. N85-28711
FRADEN, S. N85-28119
FRANK, L. A. N85-28496
FRANKS, D. T. N85-28654
FREELING, J. R. N85-28329
FRENCH, P. N. N85-28624
FRENZEN, G. N85-28502
FREUND, L. E. N85-28420
FREYMANN, R. N85-27920
FRIEDMAN, H. A. N85-28528
FRIEDMAN, L. N85-28769
FRISH, M. B. N85-28021
FRITSCH, F. N. N85-28683
FROES, F. H. N85-28086
FRYBERGER, D. N85-28719
FUJIMOTO, M. K. N85-28293
FUJIWARA, K. N85-28293
FULTON, F. J. N85-28811
FUNDERLIC, R. E. N85-28715
FUNSTEN, H. O. N85-28821

G

GALLAGHER, J. P. N85-27858
GALLIANO, P. G. N85-28299
GALLIX, R. N85-28427
GANGULI, G. N85-28497
GANS, R. F. N85-28260
GARBOW, B. S. N85-28629
GARCIA, E. L. N85-28341
GARDNER, J. H. N85-28801
GARMAN, T. R. N85-28877
GARNER, F. A. N85-28094
GARTLING, D. K. N85-28628
GASIK, M. I. N85-28030
GAT, N. N85-28138
GATES, D. M. N85-28536
GAUGER, J. R. N85-28209
GAVRILIN, P. M. N85-28136
GAY, G. N85-28053
GAZMAN, S. M. N85-28364
GEIST, G. A. N85-28715
GELB, A. N85-28454
GENESERETH, M. R. N85-28623
GEORGE, A. N85-28682
GEORGE, T. F. N85-28344
GEORGE, W. K. N85-27949
GERARDO, J. B. N85-28792
GERDIN, G. N85-28802
GETTINGS, M. E. N85-28480
N85-28490
GHOSH, A. N85-28348
GIAMEI, A. F. N85-27966
GIBSON, J. D. N85-28667
GIBSON, J. R. N85-28335
GIDAL, G. N85-28773
GIESCHEN, N. N85-28304
GIESSLER, F. J. N85-27858
GIL, S. N85-28751
GILL, R. D. N85-28707
GINZBURG, A. N85-28481
GIORDANO, S. N85-28348
GIRARD, M. A. N85-28191
GIRI, N. N85-28674
GIROUARD, R. N85-28879
GLADSHTEIN, L. I. N85-28072
GLAZE, D. J. N85-28290
GLAZOV, O. N85-28873
GMELIN, B. N85-27887
GOCHENAUR, J. E. N85-27871
GODLOVE, T. F. N85-28767
GOEDHEER, W. J. N85-28817
GOETZ, A. R. N85-27832
GOLD, A. A. N85-28439
GOLDEN, D. M. N85-28475
GOLDMAN, A. N85-27859
GOLDMAN, R. N. N85-28580
GOLDSMITH, C. T. N85-28439
GOLOMB, S. W. N85-28664
GOLOVANENKO, S. A. N85-28082
GOMEZ, J. N85-28763
GOODE, L. R., JR. N85-28820
GOODING, R. H. N85-28901
GOODMAN, L. S. N85-28545
N85-28547
GOODMAN, S. E. N85-28858
GORBUNOV, V. A. N85-28146
GORDON, W. J. N85-28589
GORLA, R. S. R. N85-27947
GOUTERMAN, M. N85-27986
GRAEBER, U. P. N85-27899
GRAMBOW, B. N85-28121
GRAY, J. E. N85-28290
GRAY, J. I. N85-28462
GRAY, W. M. N85-28524
GREEN, A. N85-28479
GREENE, J. M. N85-28720
GREENE, S. A. N85-28649
GREENIAUS, L. G. N85-28756
GREGER N85-28886
GREGORY, J. A. N85-28564
GREGSON, P. J. N85-28473
GRESHISHCHEV, B. A. N85-28137
GRIFFIN, F. P. N85-28457
GRIGORENKO, Y. M. N85-28163
GRINBERG, V. Z. N85-28364
GROSLAMBERT, J. N85-28319
GROVER, B. N85-28321
GRUNDMANN, R. N85-28285
GRUSHKO, P. D. N85-28037
GUBENKO, S. I. N85-28073
GUHA, A. N85-28841
GUILBAULT, G. G. N85-28001
GUNION, J. F. N85-28779
GUSSENHOVEN, M. S. N85-28500
GUSTAFSSON, H. A. N85-28752
GUTBROD, H. H. N85-28752
GUTOWSKI, G. A. N85-28437
GUTU, M. N85-28039

H

HABER, H. E. N85-28741
HAENEN, J. G. D. N85-28026
HAGENBERG, T. H. M. N85-27848
HAINES, J. R. N85-28815
HALFORD, G. R. N85-27961
N85-27962
HALL, J. L. N85-27829
HALLE, H. N85-28425
HAMILTON, M. L. N85-28094
HAMMOND, P. P. N85-28116
HANEL, R. A. N85-28794
HANJURA, A. K. N85-28323
HANKEY, W. L. N85-27875
HANSEN, R. S. N85-27898
HARBESON, M. M. N85-28543
HARDY, K. S. N85-28887
HARGREAVES, J. K. N85-28498
HARGREAVES, T. A. N85-28330
HARMS, K. E. N85-28091
HARMS, T. A. N85-28501
HARRINGTON, R. F. N85-28210
HARSH, M. D. N85-28259
HARTL, P. N85-28304
HARVEY, J. A. N85-28352
HARVEY, R. J. N85-28342
HASEGAWA, R. N85-28016
HASHIGUCHI, J. N85-28248
HASINGER, G. N85-28697
HAUBENREICH, P. N. N85-28721
HAYHURST, D. T. N85-28013
HAYWARD, J. N85-28223
HEATH, M. T. N85-28682
HEATHER, R. N85-28845
HEDRICK, C. L. N85-28816
HEDSTROM, J. C. N85-28466
HEFLINGER, D. G. N85-28789
HEGNER, F. N85-28338
HEIART, H. N85-28133
HEIDENREICH, W. N85-28337
HEIDER, W. N85-27874
HEIJMANS, H. J. A. M. N85-28538
HEIL, T. G. N85-28753
HEISELMANN, H. W. N85-28688
HEITMAN, P. W. N85-28109
HEKSCH, F. N85-28180
HELKEY, R. J. N85-28297
HELLWARTH, R. W. N85-28788
HELMS, H. E. N85-28109
HEMPFLING, R. N85-28218
HENLEY, E. M. N85-28761
N85-28762
HERMANN, R. N85-28338
HERNANDEZ, J. J. N85-28773
HERRMANNSFELDT, W. N85-28787
HERSHKOWITZ, N. N85-28810
HESS, A. N85-28725
HESS, K. N85-28244
HESSELINK, L. N85-27922
HETTMANSPERGER, T. P. N85-28701
HEUER, A. H. N85-28117
HEYMAN, P. J. N85-28877
HICKEY, G. N85-28100
HICKMAN, T. E. N85-28459
HILL, L. L. N85-28602
HIMEL, T. N85-28781
HINCHEN, J. J. N85-28734
HINRICHS, C. K. N85-28255
HIROSHI, I. N85-28411
HIRT, W. D. N85-28509
HIRTH, J. P. N85-27989
HITTI, B. N85-28620
HNIK, V. N85-28408
HOAD, D. R. N85-27916
HODGSON, P. E. N85-28729
HOFFMAN, R. W. N85-28017
HOGUE, L. E. N85-28241
HOKENSON, G. J. N85-28267
HOLBROOK, J. H. N85-28101
HOLLOWAY, J. N85-28011
HOLONYAK, N., JR. N85-28244
HOLST, T. L. N85-27828
HOLT, B. D. N85-28488
HOLT, W. H. N85-27977
HONG-SIANG, H. N85-28489
HOOKER, L. K. N85-28877
HOOVER, W. G. N85-28272
HORNER, R. M. N85-27894
HORNUNG, H. N85-27912
HOROWITZ, Y. S. N85-28772
HORTON, J. A. N85-28093
HOSKINS, R. F. N85-28657
HOSMAN, R. J. A. W. N85-28557
HOSSAIN, M. N85-28248
HSIAO, T. N85-28665
HSU, H. N85-28772
HUA, Q. D. N85-28296
HUANG, C. Y. N85-28496
HUBER, J. N85-28337
HUEBACHEN, G. N85-28386
HUIJBREGTS, W. M. M. N85-28046
HUIZING, R. N85-28394
HUNDSDORFER, W. H. N85-28696
HUNG, C. C. N85-28110
HURD, A. J. N85-28119
HURON, E. S. N85-27965
HURRASS, K. N85-27864
HUTH, T. C. N85-28009
N85-28343
HUXSOL, R. D. N85-28333
HYATT, R. C. N85-28297
HYMAN, E. N85-28249
N85-28407
HYMAN, J. M. N85-28807
HYNES, R. J. N85-27909

I

ILGEN, D. R. N85-28867
ILGENSTEIN, M. N85-28467
IMHOFF, C. H. N85-28378
INGELS, F. M. N85-28642
INGOLD, J. N85-28320
IPSEN, I. C. F. N85-28661
ISACOFF, D. N85-28576
ISELER, G. W. N85-28828
N85-28836
ISHIHARA, T. N85-28045
ISIHARA, A. N85-28731
N85-28732
IZDINSKY, O. N85-28387

J

JACKSON, B. N85-28735
N85-28736
N85-28845
JACKSON, K. E. N85-27852
JACOBS, P. A. N85-28423
JAEGER, D. L. N85-28573
JAEGER, H. N85-28467
JAIN, C. L. N85-28323
JAMES, G. E. N85-28212

JANK, T. N85-28503
JANSSEN, C. J. J. N85-28025
JARRETT, N. N85-28800
JENDRZEJCZYK, J. A. N85-27951
JERNIGAN, J. C. N85-27998
JIANG, Y. N85-28405
JINGFENG, X. N85-28405
JOACHUM, A. M. N85-27682
JOHNSON, B. H. N85-28659
JOHNSON, D. W. N85-28551
N85-28552
N85-28555
JOHNSON, L. R. N85-28379
JOHNSON, N. L. N85-28699
N85-28700
JOHNSON, R. N85-28196
N85-28199
JOHNSON, R. T. N85-28551
N85-28552
N85-28555
JOHNSON, W. N85-27854
JOHNSTON, D. N85-27886
JOHNSTON, K. J. N85-28310
JOHNSTON, T. Y. N85-28634
JOLIE, J. N85-28770
JONES, C. R. N85-28331
JONES, E. D. N85-28350
JONES, E. M. N85-27925
JONES, G. R. N85-28546
JONES, N. N85-28402
JONES, R. H. N85-28290
JONES, T. E. N85-28203
JORGENSEN, P. S. N85-28315
JORGENSON, P. G. E. N85-27944
JOVANOVIC, S. N85-28906
JOY, K. I. N85-28578
JOY, R. T. N85-28438
JOYCE, D. N85-28821
JUNGBLUTH, W. N85-28336

K

KAAE, J. L. N85-28427
KABANOV, V. V. N85-28164
KABRITS, S. A. N85-28166
KAGAN, Y. K. N85-28151
KAHAN, A. N85-28220
KAHAN, J. P. N85-28550
KALAFUS, R. M. N85-28199
KAMAS, G. N85-28289
KAMATH, G. S. N85-28832
KAMENOV, P. N85-28844
KAMMERER, J. J. N85-28537
KANNAPEL, M. N85-28261
KARCZEWSKA-BUCZEK, T. N85-28044
KARELESE, M. N85-28470
KASHCHEYEV, E. L. N85-28151
KASSEL, S. N85-28859
KAUFMAN, A. N85-27963
KAUL, H. J. N85-27908
KAWABATA, F. N85-28358
KAYSER, E. G. N85-28005
KAZNACHEYEV, B. A. N85-28716
KEAR, B. H. N85-28800
KEARSLEY, E. N85-28772
KEATING, R. E. N85-28309
KEEFE, D. N85-28767
KEEFER, K. D. N85-28115
KEKELIUK, S. N85-27857
KELLER, A. S. N85-28253
KELLER, H. B. N85-28846
KELLEY, B. T. N85-28829
KELLY, S. N85-28598
KEMP, N. H. N85-28454
KEMPTON, J. N85-28820
KENNEDY, R. S. N85-28543
KENNY, M. C. N85-28414
KEREKOV, S. N85-28355
KERR, R. M. N85-28264
KERSLEY, L. N85-28207
KEY, K. N85-28245
KHALAMEZ, E. M. N85-28364
KHANIN, G. A. N85-28150
KHANIN, L. G. N85-28150
KHANOV, Y. P. N85-28384
KHATTREE, R. N85-28673
KHOSRAWI, M. A. N85-28381
KHROMCHENKO, M. N85-28874
KIBBLER, A. N85-28842
KIDD, V. R. N85-28911
KIEPEZYNSKI, W. N85-28304
KILKENNY, E. A. N85-27853
KIM, J. H. N85-28108
KIM, J. S. N85-28243
KIM, W. S. N85-27968
KIMME, E. G. N85-28317
KING, R. S. N85-27995
KINOSHITA, G. S. N85-28460
KIRILLIN, A. V. N85-28174
KIRSTEINS, I. P. N85-28232
KITIPORNCHAI, S. N85-28413
KIUCHI, K. N85-28040
KLEIN, N. N85-28131
KLENNER, J. N85-27975
N85-27976
KLENOWICZ, Z. N85-28033
KLOK, F. N85-28636
KLOMPE, A. W. H. N85-28429
KLOP, J. W. N85-28214
N85-28638
KLYUKIN, A. A. N85-28146
KNAUBER, R. N. N85-28611
KNAUTS, H. E. N85-28888
KNEELAND, B. T. N85-27896
KOCH, F. O. N85-28388
N85-28389
KOCH, K. H. N85-28074
KOGAN, M. N. N85-28159
KOK, J. N. N85-28639
KOK, M. N85-28637
KOLARIK, L. O. N85-28023
KOLB, B. N85-28752
KOLESNIKOV, A. F. N85-28160
KOLESNIKOV, S. Y. N85-28368
KOLESNIKOV, Y. B. N85-28146
KOLODEJ, B. N85-28028
N85-28354
KOLOKOLOV, V. Y. N85-28148
KONDO, T. N85-28040
KONINGS, L. J. M. N85-28025
KONONOVA, V. I. N85-28136
KORITTA, J. N85-28049
KORTE, U. N85-27892
KORTING, P. A. O. G. N85-28024
KORZHNEV, V. N. N85-28161
KOSKOV, V. D. N85-28084
KOSMINSKAYA, I. P. N85-28487
KOSSLER, W. J. N85-28820
KOSTANOVSKIY, A. V. N85-28174
KOTLAR, A. J. N85-27993
KOTZ, S. N85-28699
N85-28700
KOVTUN, N. M. N85-28171
KOWALENKO, V. N85-28799
KOZLOV, S. A. N85-28137
KRAG, B. N85-27897
KRAMER, G. N85-28680
KRAMERS, V. A. N85-28024
KRASNOBAYEV, K. V. N85-28162
KRAUSE, M. N85-28543
KRAUSHAAR, W. L. N85-28910
KREISCHER, K. E. N85-28754
KREUTZER, H. N85-28257
KRICHEVSKII, E. M. N85-28136
KRISHBERG, R. R. N85-28145
KRISHNA, C. M. N85-28644
KRISHNAPRASAD, P. S. N85-28660
KRISTIANSEN, M. N85-28237
KRIZ, K. N85-28433
KROMBACH, M. N85-28561
KROMP, W. N85-27967
KROMPHOLZ, H. N85-28237
KRUGLIKOV, S. V. N85-28151
KRUPIN, Y. A. N85-28062
KUCERA, H. N85-28594
KUCERA, J. N85-28404
KUENDIG, W. N85-28820
KUKIK, V. M. N85-28056
KULAKOVSKAYA, N. A. N85-28149
KULKARNI, V. G. N85-28710
KUMAR, K. N85-28323
KUMAR, R. N85-28468
KUNCL, F. N85-28075
KURTH, R. N85-27954
KUSSMAUL, K. N85-28069
KUSTOM, R. L. N85-28120
KUZILIN, Y. Y. N85-28153
KWON, T. M. N85-28321
KYOSHI, I. N85-28247

L

LABOVITZ, M. L. N85-28877
LAFON N85-27918
N85-27919
LAGROSS, D. L. N85-28505
LAM, N. Q. N85-28092
LAMBIEV, D. N85-28844
LAMBIRD, B. N85-28672
LAMORTE, M. F. N85-28461
LANDECKER, P. B. N85-28908
LANGLEY, P. N85-28549
LANKFORD, W. F. N85-28820
LANNIN, J. S. N85-28016
LANT, C. T. N85-27969
LARSEN, E. W. N85-28678
LARSEN, R. P. N85-28379
N85-28380
LARSON, D. C. N85-28352
LARSON, N. M. N85-28352
LATER, D. W. N85-27974
LAUSSERMAIR, F. N85-27931
LAUWERIER, H. A. N85-28695
N85-28795
LAUX N85-27918
N85-27919
LAVINE, D. N85-28672
LAW, C. K. N85-27997
LAWRENCE, G. H. N85-28553
LAZZARINI, A. N85-28751
LEADBETTER, M. R. N85-28665
LEBEDEFF, S. N85-28517
LECH, W. N85-28230
LECLAIRE, B. N85-28632
LEDBETTER, F. E., III N85-28107
LEDBETTER, M. N85-28769
LEDWA, K. N85-27976
LEE, C. S. N85-28524
LEE, D. K. N85-28816
LEE, Y. H. N85-28643
LEE, Y. T. N85-28008
LEIFKER, D. N85-28672
LEISSA, A. W. N85-27868
LEKHTLA, T. N85-28875
LENNINGTON, J. W. N85-28329
LEROY, A. N85-28706
LESCHIUTTA, S. N85-28299
LESLIE, F. N85-28260
LEUPP, D. G. N85-28598
LEVER, A. B. P. N85-27986
LEVINE, J. N85-28290
LEVINE, R. R. N85-28541
LEVY, A. N85-28100
LEWELLEN, W. S. N85-28523
LI, Y. N85-28820
LIDL, J. N85-28471
LIEB, B. J. N85-28821
LIEBERT, C. H. N85-27970
LIGHTHART, L. P. N85-28527
LIKWING, L. N85-28048
LILEEV, A. S. N85-28050
LILLEY, D. G. N85-27867
LIN, S. N85-28105
LIND, V. G. N85-28821
LINDGREN, L. C. N85-28109
LINDQUIST, G. H. N85-28329
LISTER, D. H. N85-28326
LISTER, M. J. N85-28299
N85-28303
N85-28310
LIU, C. T. N85-28093
LIU, J. N85-28682
LIU, W. K. N85-27957
LIVINGSTON, F. R. N85-28445
LIXIN, Z. N85-28048
LOCK, D. K. N85-28751
LOCK, J. A. N85-28786
LOEBNERL, E. E. N85-28864
LOEHNER, H. N85-28752
LOENING, K. L. N85-27974
LOESER N85-27918
N85-27919
LOEWENTHAL, S. H. N85-28371
LOHMAN, A. L. N85-27992
LOOTSMA, F. A. N85-28655
N85-28711
N85-28870
LORENZ, R. N85-28469
LOU, X. C. N85-28391
LOWENSTEIN, D. I. N85-28759
N85-28760
LOYD, M. L. N85-28631
LU, W. J. N85-27987
N85-28228
LUBRANO, L. L. N85-28860
LUCATORTO, T. B. N85-28018
LUCIUS, M. E. N85-28589
LUCK, J. M. N85-28294
LUDEWIGT, B. N85-28752
LUDLAM, T. N85-28748
LUDWIG, R. W. N85-28877
LUEBECK, G. N85-28761
LUEDER, E. N85-28257
LUHMANN, N. C., JR. N85-28814
LUKAC, C. F. N85-28309
LUND, D. J. N85-28534

LUNDQVIST, G. N85-28310
LUNDSTROM, M. S. N85-28462
LUSAK, L. I. N85-28066
LUSTIG, N. N85-28016
LUTHER, G. N85-28303
LUYTER, W. M. N85-28025
LYNCH, T. J. N85-28302
LYUTS, V. Y. N85-28407

M

MACDOWALL, R. D. N85-28888
MACK, J. M. N85-28772
MACKINLAY, J. N85-28623
MACURA, P. N85-28396
MADONNA, R. G. N85-27932
N85-28911
MAGUIRE, P. K. H. N85-28482
MAIA, M. D. N85-28847
MAIR, A. N85-28479
MAJUMDAR, S. N85-27964
MAKATURA, G. T. N85-28582
MALDJIEVA, R. N85-28064
MALIK, B. U. N85-27981
MALINOV, L. S. N85-28071
MALINOVSKA, E. N85-28356
MANCHUROVA, Y. N85-28874
MANCINI, T. R. N85-28793
MANDELL, J. F. N85-28414
MANDERSCHEID, J. M. N85-27963
MANSON, S. S. N85-27962
MANUKHIN, Y. A. N85-28151
MANUYLOVICH, S. V. N85-28158
MARAM, J. M. N85-27971
MARCIANO, W. J. N85-28771
MARGOLIN, L. G. N85-28684
MARONNA, R. N85-28677
MAROTEL, G. N85-28318
MARTENS, J. A. N85-28865
MARTIN, C. R. N85-28730
MARTIN, R. M. N85-27916
MARVEL, C. S. N85-28105
MASAMITSU, O. N85-28252
MASSEY, D. N85-28642
MASTIN, C. W. N85-28581
MASTINOVSKIY, V. V. N85-28169
MASUMOTO, H. N85-28411
MASUOKA, E. J. N85-28877
MATHES, J. N85-27918
N85-27919
MATHUR, B. S. N85-28323
MATSUZAKI, K. N85-27983
MATTAS, R. F. N85-28810
MATTHEW, M. N85-28769
MATTHEWS, A. J. N85-28505
MAUTZ, J. R. N85-28210
MAYORCHUK, M. A. N85-28151
MAYOROV, G. P. N85-28147
MCADAMS, R. E. N85-28821
MCALLISTER, D. F. N85-28575
MCBRIDE, D. K. N85-28544
MCCAA, B. B. N85-27999
N85-28000
MCCAMMON, D. N85-28910
MCCANN, D. W. N85-28509
MCCARTHY, K. C. N85-28509
MCCASKILL, T. B. N85-28298
MCCLAIN, J. S. N85-28483
MCDANIEL, J. K. N85-28421
MCDEVITT, J. B. N85-27823
MCDONALD, J. A. N85-28603
N85-28604
MCFADDEN, J. P. N85-28417
MCGARRY, F. J. N85-28414
MCGEHEE, J. R. N85-27902
MCGEOCH, M. W. N85-28738
MCGOWAN, J. N85-27863
MCHENRY, W. K. N85-28656
MCKENZIE, D. L. N85-28908
MCKEOWN, W. L. N85-27843
MCLAUGHLIN, H. W. N85-28568
MCMONAGLE, D. R. N85-27888
MCMULLEN, S. A. N85-28229
MCMULLIN, P. G. N85-28243
MCRUER, D. N85-27886
MCTIGUE, D. F. N85-28630
MEAD, G. H. N85-27930
MEEKS, G. R. N85-28286
MEHLO, H. N85-28385
MEIJER, H. G. N85-28689
MEINKE, J. N85-27918
N85-27919
MEISEL, L. V. N85-28089
MEISNER, J. N85-28870
MELO, A. V. N85-28017
MENENDEZ, M. G. N85-28739
MENUSHENKOV, V. P. N85-28050
MERRITT, F. L. N85-28219
MERRITT, J. E. N85-27974
METIU, H. N85-27994
N85-28735
N85-28736
N85-28737
N85-28830
N85-28845
MEYER, R. B. N85-28119
MEYERS, C. J. N85-28025
MIAMEE, A. N85-28669
MICALE, F. J. N85-28108
MIKULAS, M. M., JR. N85-27934
MILEAN, A. N85-28193
MILEANT, A. N85-28190
MILEY, G. K. N85-28894
MILKEREIT, B. N85-28484
MILLER, D. G. N85-28251
MILLER, H. N85-28485
MILLER, L. E. N85-27875
MILLER, L. G. N85-28811
MILLER, W. J. N85-28649
MILLIGAN, W. W. N85-27984
N85-27985
MILLS-BAKER, P. N85-28797
MINKOV, M. V. N85-28078
MINOR, P. C. N85-27986
MITCHELL, K. J. N85-28880
MITIN, B. S. N85-28080
MIZIOLEK, A. W. N85-28002
MOCK, W., JR. N85-27977
MOGAB, C. J. N85-28800
MOLCHANOV, A. N. N85-28171
MOLCHANY, J. W. N85-28541
MOLGA, M. N85-28518
MONTANET, L. N85-28773
MOOK, D. E. N85-28895
MOONEY, W. D. N85-28476
N85-28486
N85-28490
N85-28491
MOORE, G. W. N85-27865
MOORE, L. J. N85-28018
MOORHOUSE, D. J. N85-27910
MOOSE, W. J. N85-28778
MORAN, W. A. N85-27895
MORE, J. J. N85-28629
MORFIN, J. G. N85-28746
MORGAN, M. N85-27857
MORGENTHALER, S. N85-28677
MORRIS, D. L. N85-27902
MORRIS, J. W., JR. N85-28097
N85-28098
MORSE, P. I. N85-28351
MOSCOVITCH, M. N85-28772
MOSENDZ, N. A. N85-28056
MOSHER, F. R. N85-28510
MOVCHAN, M. B. N85-28042
MOYER, R. D. N85-28256
MUCKENTHALER, T. V. N85-27937
MUELLER, S. N85-28477
MUELLER, W. N85-28724
MUKERJEE, T. N85-28261
MUKHA, I. S. N85-28163
MULAC, R. A. N85-27945
MULARZ, E. J. N85-27870
MULDER, W. A. N85-28687
MULLENDER, S. J. N85-28605
N85-28650
N85-28651
N85-28652
MUNCHMEYER, F. N85-28587
MURA, T. N85-28419
MURPHY, C. E., JR. N85-28469
MURRAY, J. A., JR. N85-28287
MURRAY, R. W. N85-27998
MURTHY, H. S. N85-27837
MUSSELMAN, J. A. N85-28654
MUSSENER, K. M. N85-28304
MYERS, T. N85-27886

N

NAGAEVSKII, I. D. N85-28056
NAGLE-ESHLEMAN, J. N85-28397
N85-28400
NAGORNYY, Y. I. N85-28169
NAGPAL, V. K. N85-27958
NAGTEGAAL, J. N85-27956
NAMKUNG, M. N85-28820
NARATHONG, C. N85-28622
NARDUCCI, L. M. N85-28348
NAU, H. H. N85-28304
NAYMARK, S. I. N85-28151
NEEDLEMAN, A. N85-28420
NELLUMS, R. O. N85-28458
NELSON, C. J. N85-28528
NETA, B. N85-28698
NEUBAUER, F. M. N85-28909
NEUGEBAUER, G. N85-28894
NEUMAIER, P. N85-28382
NEUMAN, E. N85-28574
NEVEROV, V. A. N85-28178
NEWELL, J. F. N85-27953
NEWTON, J. N85-27839
NICHOLSON, W. L. N85-28600
NICI, R. N85-28676
NICOLOV, N. N85-28409
NIEUWKERT, L. R. N85-28527
NIKITIN, V. N. N85-28031
NIKOLOV, M. N85-28060
NINOMIYA, R. N85-27983
NISHIDA, S. I. N85-28411
NITZAN, A. N85-28830
NONINSKI, K. N85-28034
NONINSKI, V. N85-28034
NORDQUIST, A. F. N85-28014
NORMAN, D. C. N85-27909
NORTON, C. C. N85-28506
NORTON, J. N85-28821
NOSOV, V. N. N85-28083
NOSTRAND, P. M. N85-28499
NOVOTNY, J. N85-28353
NOYAN, I. C. N85-28067
N85-28068
NUTT, K. W. N85-28263

O

OAKS, O. J. N85-28299
N85-28303
N85-28310
ODEH, F. N85-28675
OGRADY, W. E. N85-28017
OHLSSON, S. N85-28549
OKAMOTO, P. R. N85-28092
OKUNO, A. F. N85-27823
OLEARY, G. C. N85-28226
OLSEN, W. N85-27839
OLSON, E. N85-28672
OLSZEWSKI, M. N85-28455
OMARA, P. N85-28534
OMEARA, T. R. N85-28339
ONDRASIK, V. J. N85-28306
ONEILL, M. J. N85-28465
ONG, E. T. N85-28455
OPARIN, A. N. N85-28152
OPELT, M. N85-28257
OPRESKO, D. M. N85-28542
ORCUTT, J. A. N85-28483
OREHOTSKY, J. N85-28452
ORTEGA, J. M. N85-28612
OSTROUCHOV, G. N85-28681
OTTESON, O. H. N85-28621
OVERBURY, S. H. N85-28757
OWENS, J. F. N85-28748
OWENS, J. M. N85-28547
OWENS, S. F. N85-28261

P

PAAR, H. P. N85-28776
PADEVET, V. N85-28900
PADFIELD, G. D. N85-27890
PAFFRATH, D. N85-28471
N85-28472
PAFFRATH, M. N85-28504
PAGANONI, D. N85-28383
PAINTER, G. O. N85-28422
PAISLEY, D. J. N85-27827
PALLUCONI, F. D. N85-28286
PALMER, R. B. N85-28348
PALMER, W. F. N85-28680
PAN, V. N85-28663
PANGMAN, M. E. N85-28886
PARKER, R. D. N85-28371
PARKER, S. F. N85-28523
PARROTT, B. N85-28861
PARRY, S. R. N85-28592
PARTRIDGE, E. C., III N85-28198
PASSCHIER, W. F. N85-28774
N85-28775
PATON, B. E. N85-28056
PATTERSON, B. D. N85-28820
PAUL, C. R. N85-28242
PAVLENKOVA, N. I. N85-28487
PEARCE, E. M. N85-28106

PEARSON, A. M. N85-28448
PEARSON, D. D. N85-27966
PECK, D. E. N85-28227
PEDERSEN, J. N85-28603
N85-28604
PEDERSEN, T. S. N85-28515
PEERCY, R. L., JR. N85-27930
PEGGION, G. N85-28270
PELACCIO, D. G. N85-27971
PELEGRIN, M. J. N85-27884
PENN, B. G. N85-28107
PEREY, F. G. N85-28352
PERSCH, H. N85-28386
PESARAN, A. A. N85-28019
PESKIN, M. E. N85-28760
PETERS, H. P. N85-28882
PETERS, W. N85-28471
PETERSEN, R. P. N85-28555
PETERSON, D. P. N85-28570
PETRI, R. J. N85-28455
PETRUCCI, S. N85-28240
PETRY, D. N85-28437
PETTENPAUL, E. N85-28337
PETTITI, V. N85-28299
PFIRMAN, S. L. N85-28530
PHOENIX, S. L. N85-28118
PICKELMANN, P. N85-28070
PIERANTOZZI, R. N85-28014
PIERCE, D. E. N85-28352
PIERCE, F. J. N85-28259
PIERCE, R. N85-28437
PIKE, J. N85-28372
PIMENOV, Y. D. N85-28153
PINCZOLITIS, H. N85-27967
PINKOWSKI, S. N85-27971
PINSKY, S. S. N85-28680
PINTO, J. S. N85-28657
PIRMATOV, R. K. N85-28170
PISKOVA, V. P. N85-28036
PITCHFORD, A. N85-28494
PITCHFORD, M. N85-28494
PITZ, W. J. N85-28010
PLANK, V. G. N85-28505
PLENDL, H. S. N85-28821
POHLMANN, H. J. N85-28125
N85-28126
POLL, D. I. A. N85-27826
N85-27827
POLLARA, F. N85-28192
POLYAKOV, P. I. N85-28171
POPOV, B. G. N85-28167
POPOV, Y. I. N85-27933
PORTER, F. C. N85-28773
PORTNOY, W. M. N85-28229
PORZIO, A. J. N85-28268
POSCHET, G. N85-28123
N85-28393
POSKANZER, A. M. N85-28752
POSPIECH, A. N85-28435
POTATURKIN, O. I. N85-28152
POUKEY, J. W. N85-28755
POVINELLI, L. A. N85-27942
POWER, G. D. N85-27950
POWERS, B. G. N85-27900
POZNYAK, E. L. N85-28147
PRAAGMAN, N. N85-28686
PRAKASH, C. N85-28261
PRATT, M. J. N85-28569
PRIBYL, V. J. N85-28534
PRIESTLEY, A. J. N85-28023
PRIETO, N. E. N85-28730
PRODEHL, C. N85-28476
N85-28488
N85-28491
PRZEKWAS, A. J. N85-28261
PTITSYNA, N. G. N85-28909
PUGH, H. G. N85-28744
PURI, O. P. N85-28122
PUSTOVOIT, V. N. N85-28051

Q

QIU, C. H. N85-27826

R

RAASCH, R. F. N85-27930
RABEZZANA, F. N85-28365
RABIN, U. H. N85-27896
RABINOVITCH, B. S. N85-28733
RACKO, D. N85-28722
RADEKA, V. N85-28348
RAE, W. J. N85-27949
RAITH, H. N85-28607
RAKOWSKY, P. J. N85-27845
RALSTON, R. W. N85-28235
RAMAN, E. V. N85-28167
RANDIG, G. W. N85-28213
RANDOLPH, M. A. N85-28231
RARD, J. A. N85-28251
RAY, A. N85-28751
REED, G. W., JR. N85-28906
REESE, R. W. N85-28253
REEVE, D. A. N85-28325
REEVES, C. A., JR. N85-28633
REIF, J. H. N85-28233
N85-28663
REINHARDT, M. E. N85-27862
REINHARDT, V. N85-28320
RENNER, T. N85-28752
RENOULT, P. N85-28318
REPINA, N. I. N85-28037
REPPERGER, D. W. N85-28560
RESCH, G. M. N85-28512
REUTER, K. N85-28124
REVUTSKIY, V. N. N85-28165
REVYAKIN, Y. L. N85-28176
REYN, J. W. N85-28278
N85-28281
RHEIN, R. A. N85-28111
RHODES, D. L. N85-27867
RHODES, M. D. N85-27934
RICE, C. N85-28863
RICHARD, M. N85-28185
RICHARDS, W. R. N85-27891
RICHTER, A. K. N85-28909
RICHTER, F. N85-28065
RICHTER, N. J. N85-28413
RICHTER, R. N85-28442
RICHTOL, H. H. N85-27990
RIEDESEL, H. N85-28752
RIFF, R. N85-27959
RILEY, W. J. N85-28302
RIND, D. N85-28517
RISING, J. J. N85-27898
RITTENBERG, A. N85-28773
RITTER, H. G. N85-28752
RIVANENOK, T. N. N85-28072
RIVLIN, R. S. N85-28269
ROBBEN, K. D. N85-28607
RODDECK, W. N85-28395
RODLOFF, R. N85-28336
RODRIGUEZ, L. M. N85-28362
RODRIGUEZ, R. N. N85-28700
ROELFZEMA, A. N85-28470
ROESER, S. F. N85-28903
ROESSLER, W. N85-28467
ROGERS, A. E. E. N85-28310
ROGERS, H. C. N85-28418
ROHLF, D. N85-27881
ROMAN, P. N85-28718
RONG-SHENG, Z. N85-28489
RONZHIN, S. N85-28200
ROOS, M. N85-28773
ROSATI, V. J. N85-28322
ROSEFIELDE, S. N85-28862
ROSENAU, P. N85-28807
ROSENBAUER, H. N85-28909
ROSENBERG, D. A. N85-28132
ROSENBERGER, F. E. N85-28822
N85-28823
ROSENBLATT, D. H. N85-28005
ROSINSKI, J. N85-28703
ROSSI, M. J. N85-28475
ROUSSEEUW, P. N85-28706
ROYCE, B. S. H. N85-27869
RUBINSTEIN, R. N85-27960
RUDASEV, V. B. N85-28360
RUDCHENKO, A. V. N85-28072
RUEGG, R. S. N85-28620
RUESCH, R. E. N85-28615
RUF, G. N85-28124
RUSSELL, H. H. N85-27877
RUTH, R. D. N85-28766
RUTMAN, J. N85-28312

S

SAAD, Y. N85-28714
SABIN, M. N85-28572
SACHS, R. G. N85-28782
SAHU, J. N85-28265
SAIFI, M. N85-28320
SAMSONENKO, S. V. N85-28202
SANDERS, W. T. N85-28910
SANDERSON, R. W. N85-28464
SANFORD, T. W. L. N85-28755
SANTAVICCA, D. A. N85-27869
SAPP, J. W. N85-28654
SASSEN, K. N85-28896
SATO, K. N85-28410
N85-28411
SAUSA, R. C. N85-28002
SAVULA, Y. G. N85-28163
SAWADA, H. N85-27963
SAWADA, S. I. N85-28737
N85-28830
N85-28845
SAXANA, M. N85-28323
SAXMAN, A. N85-28347
SCALEA, J. C. N85-27917
SCHAEFER, J. T. N85-28509
SCHAFER, C. N85-28260
SCHAFER, W. N85-28304
SCHAFRANEK, D. N85-27880
SCHATZ, G. C. N85-27968
SCHELLEMANS, F. N85-28870
SCHERR, S. J. N85-27875
SCHLESINGER, M. E. N85-28526
SCHLIER, R. E. N85-28738
SCHMERWITZ, D. N85-27882
SCHMIDT, J. N85-28641
SCHNAUBER, H. N85-28561
SCHOCK, H. J. N85-28786
SCHOEYER, H. F. R. N85-28024
SCHRONK, L. N85-28179
SCHULZ, P. N85-27864
SCHUTKEKER, J. B. N85-28754
SCHWARTZ, D. L. N85-28448
SCHWARTZ, R. J. N85-28462
SCHWARZE, G. E. N85-28222
SCHWENTERLY, S. W. N85-28721
SCHWERING, F. N85-28196
SCIBBE, H. W. N85-28371
N85-28373
SCOTT, P. M. N85-28101
SEALS, R. H. N85-28352
SEDERBERG, T. W. N85-28592
SEELIGER, R. N85-27985
SEGAL, A. N85-28686
SEGAWA, T. N85-27983
SEIDEL, M. N85-27913
SEIFERAS, J. N85-28606
SEIFERT, R. N85-27921
SEINO, K. C. N85-28635
SELBY, R. W., JR. N85-28619
SELCUK, M. K. N85-28447
SELEGAN, D. R. N85-27910
SELEZNEV, A. V. N85-28173
SELLA, F. N85-27908
SELLERS, V. E. N85-28439
SENCHENKO, I. V. N85-28168
SENGUPTA, A. N85-28323
SENICHKIN, V. V. N85-28042
SEREDNITSKAYA, M. A. N85-28175
SEROVA, V. D. N85-28155
SESSLER, A. M. N85-28764
SETHURAMAN, J. N85-28831
SHAFER, S. A. N85-28595
SHAFFER, L. E. N85-28717
SHAHEEN, J. M. N85-28218
SHAMROTH, S. J. N85-27824
N85-27825
SHAO-QUAN, Z. N85-28489
SHARMA, L. K. N85-27971
SHASTIN, E. G. N85-28148
SHAVELSON, R. J. N85-28550
SHAW, B. J. N85-28096
SHAW, J. B. N85-28548
SHAW, R. N85-27839
SHEATHER, S. J. N85-28701
SHIELDS, D. M. N85-28787
SHIN, K. G. N85-28643
N85-28644
SHIN, S. H. N85-28835
SHIPILOV, S. D. N85-28161
SHIPOV, P. M. N85-28152
SHISHKO, A. Y. N85-28145
SHISONG, M. N85-28699
SHIWA, Y. N85-28731
N85-28732
SHOMPER, K. A. N85-28618
SHOOSMITH, J. N. N85-28563
SHOWALTER, R. C. N85-28520
SHTREMEL, A. N85-28403
SHTREMEL, M. A. N85-28062
SHUQING, L. N85-28066
SHVAB, I. A. N85-28173
SHVARTS, V. M. N85-28367
SIEBERS, A. L. N85-28509
SILBERMANN, R. N85-28338
SIMITSES, G. J. N85-27959
SIMON, M. K. N85-28190
N85-28193
SIMONEAU, R. J. N85-27948

SIMONS, G. N85-28705
SIMONSEN, C. N85-28515
SINELNIKOV, M. I. N85-28035
SINGH, J. J. N85-27977
SINGH, J. P. N85-27962
SINGHAL, A. K. N85-28261
SINGLER, A. N85-28215
SINGLETON, M. F. N85-28839
SINHA, B. K. N85-28674
SINTSOV, V. N. N85-28153
SITNIK, N. A. N85-28153
SIVARAMAN, M. R. N85-28323
SKALON, A. I. N85-28172
SKELTON, E. A. N85-28728
SKOK, Y. Y. N85-28042
SKUDRIDAKIS, J. N85-27897
SKURATOV, L. P. N85-28055
SKURIDIN, A. A. N85-28080
SLABY, J. N85-27935
SMART, M. J. N85-28616
SMITH, C. A. N85-27854
SMITH, J. R. N85-28099
SMITH, K. A. N85-28555
SMITH, L. N85-28587
SMITH, P. R. N85-28086
N85-28616
SMITH, R. B. N85-28477
SMITHRICK, J. J. N85-28444
SNOVER, K. A. N85-28783
SNYDER, A. M. N85-28813
SOBIECZKY, H. N85-27838
SOIFER, B. T. N85-28694
SOLOMON, M. H. N85-28648
SOMMEIJER, B. P. N85-28698
SPENCER, J. H. N85-28305
N85-28310
SPIJKER, M. N. N85-28696
SPOHRER, T. N85-28558
ST.CLAIR, T. L. N85-27977
STACEY, J. M. N85-28191
STAIGER, P. J. N85-27972
STAIR, P. C. N85-27988
STALDER, T. N85-28303
N85-28320
STAMPER, D. A. N85-28541
STAMPS, R. E. N85-28721
STANEWSKY, E. N85-27912
STARCZEWSKI, M. N85-28044
STEAD, S. E. N85-28582
STEBBINS, S. B. N85-28298
STECKL, A. J. N85-27987
N85-28228
STEIJN, L. N85-27929
STEIN, S. R. N85-28289
N85-28290
STEIN, Y. N85-27869
STEPHENS, M. A. N85-28704
STERENBOGEN, Y. A. N85-28056
STERLING, M. W. N85-28589
STICH, G. N85-27882
STIELER, B. N85-27850
STILLMAN, G. E. N85-28244
STOIBER, R. N85-28304
STOLZENBERG, R. M. N85-28550
STRAYER, D. M. N85-28324
STREIT, R. L. N85-28671
STRONACH, C. E. N85-28820
N85-28821
STRUIJK, A. J. N85-28470
STRUMIA, A. N85-28187
STUMER, I. N85-28348
STYS, A. N85-28437
SUDOL, E. D. N85-28108
SULEYMANOV, N. T. N85-28154
SULLIVAN, M. N85-28727
SUNDYREV, I. A. N85-28077
SURAMPUDI, S. P. N85-27946
SURI, A. K. N85-28323
SUTHERLIN, C. T. N85-28493
SUYAMA, M. N85-27983
SUZUKI, L. R. C. N85-28625
SWENSON, L. W. N85-28821
SYKES, R. I. N85-28523
SYNKOV, V. G. N85-28171
SZABO, G. N85-28178
SZENTIRMAY, M. N. N85-28730

T

TACK, T. N85-27918
N85-27919
TAKACS, P. N85-28348
TANNEBAUM, A. S. N85-28650
TARDY, D. C. N85-28733
TAYLOR, B. A. N85-28660
TAYLOR, B. K. N85-28658
TAYLOR, M. R. N85-28624
TEBOULLE, M. N85-28713
TEMKIN, R. J. N85-28754
TEMME, N. M. N85-28692
N85-28693
N85-28694
TENNERY, V. J. N85-28113
TERENTYEV, V. P. N85-28168
TERIELE, H. J. J. N85-28697
TERRY, P. W. N85-28809
THOMA, D. J. N85-27961
THOMAS, C. N85-28725
THOMASSON, R. E. N85-27909
THOMPSON, J. A. N85-27973
THOMPSON, J. F. N85-28584
N85-28659
N85-28627
THOMPSON, T. R. N85-28109
THRASHER, S. R. N85-28120
TIDONA, J. N85-28843
TIHANYI, J. N85-28591
TILLER, W. N85-28175
TIMROT, D. L. N85-28160
TIRSKIY, G. A. N85-28588
TODD, P. H. N85-28773
TOERNQVIST, N. A. N85-27940
TOLBERT, R. N. N85-27888
TOLES, R. D. N85-28129
TOLLE, F. F. N85-28097
TOMOTA, Y. N85-28098
TOMPKINS, F. G. N85-28593
TOPE, M. N85-28308
TOSHIO, T. N85-28252
TOULOUSE, P. N85-27907
TOWNSEND, D. P. N85-28373
TRAVIS, J. C. N85-28016
TRENTI, O. N85-28359
TRESTER, P. W. N85-28427
TRINKS, H. N85-28135
TRIPPE, T. G. N85-28773
TRYK, D. N85-28248
TSENG, C. M. N85-28108
TSONG, I. S. T. N85-28834
TUER, T. W. N85-28329
TUNSTALL, J. N. N85-28277
TURKOWSKI, W. N85-28245
TURNER, R. R. N85-28535
TYURIN, N. N85-28189

U

UEBERSFELD, J. N85-28312
ULYANIN, E. A. N85-28082
UMAROVA, M. I. N85-28143
N85-28144
UMLAUF, D. N85-28383
UPPULURI, V. R. R. N85-28685
USTINOV, M. V. N85-28159
UYEDA, H. N85-28516
UZIEL, M. S. N85-28542

V

VAIDYANATHAN, K. V. N85-28832
VALDMANIS, Y. Y. N85-28145
VALENTINE, M. J. N85-28596
VALLEY, C. R. N85-28443
VAMETTEN, D. N85-27863
VANBEEK, P. N85-28279
VANDALSEM, W. R. N85-27828
VANDE VAN, A. H. N85-28852
N85-28853
VANDE VEN, A. H. N85-28854
VANDENBOSCH, P. P. J. N85-28655
VANDENBOSCH, R. N85-28751
VANDERBURGH, A. H. P. N85-28428
N85-28690
VANDERHOEVEN, P. C. T. N85-28531
N85-28532
N85-28533
VANDERHOFF, J. W. N85-28108
VANDERHOUWEN, P. J. N85-28698
VANDERMARK, M. B. N85-28796
VANDERVAART, J. C. N85-28557
VANDIERENDONCK, A. J. N85-28296
VANDIJK, G. M. N85-28394
VANDUYN, C. J. N85-28282
VANDUYNE, R. P. N85-27968
VANGOOL, M. F. G. N85-27905
VANHOLTZ, R. C. N85-28883
VANISACKER, P. N85-28770
VANKAN, J. N85-28280
VANKUIJK, R. M. N85-28394
VANLEER, B. N85-27834
N85-28687
VANLIERE, J. N85-28394
VANOTTERLOO, P. J. N85-28691
VANOVERBEKE, T. J. N85-27943
VANROOYEN, D. N85-28095
VANSTRALEN, S. J. D. N85-28025
VANWANING, W. E. N85-28139
VARGAS, L. M. N85-28130
VARNUM, F. B. N85-28314
VARRIOT, J. N85-28059
VASILEV, V. A. N85-28080
VASILYEV, Y. I. N85-28156
VEENSTRA, L. N85-28304
VERBUNT, J. H. G. N85-28025
VERGHESE, G. C. N85-28391
VERHOEF, W. N85-28440
N85-28796
VIG, J. R. N85-28236
VINOGRADOV, V. L. N85-28174
VINOGRADOV, V. N. N85-28201
VISSCHER, W. N85-28026
VISWANATHAN, V. K. N85-28347
VITANYI, P. M. B. N85-28606
N85-28652
N85-28653
VLASOV, V. M. N85-28364
VOGELSONG, T. L. N85-28225
VOGLSINGER, M. N85-27851
VORONOV, I. N. N85-28038

W

WAAK, J. A. N85-28305
WADE, J. C. N85-28224
WAGER, J. F., III N85-28832
WAHL, H. J. N85-28388
WALKER, D. J. N85-27894
WALKER, H. C., JR. N85-27991
WALKER, M. J. N85-27908
WALLS, F. L. N85-28236
WALTE, F. N85-28724
WALTERS, W. F. N85-28679
WALTMAN, W. B. N85-28310
WAMBSGANSS, M. W. N85-27951
N85-28425
WANG, S. Y. N85-27972
WANG, Y. C. N85-28826
N85-28827
WANHILL, R. J. H. N85-28430
WANLESS, M. W. N85-28842
WARD, W. E. N85-28855
WARDRIP, S. C. N85-28299
N85-28303
N85-28320
WARMBRODT, W. N85-27854
WARNER, D. D. N85-28770
WARREN, H. N85-28303
WARREN, J. N85-28348
WARSI, Z. U. A. N85-28583
WASIAK, A. N85-28104
WATERS, S. B. N85-28113
WATKINSON, P. S. N85-28398
WATSON, J. H. N85-27888
WATTS, K. D. N85-28813
WEBB, G. N85-27866
WEBB, N. N85-28550
WEBB, W. B. N85-28540
WEIGELT, F. P. N85-28561
WEILAND, T. N85-28750
WEINSTEIN, C. J. N85-28197
WEISS, D. E. N85-28023
WEISS, M. N85-28295
WEITZ, E. N85-27986
N85-28003
WELLS, J. E. N85-28294
WENDE, C. M. N85-28304
WENG, W. T. N85-28786
WENG, Z. Y. N85-28312
WERNER, L. N85-28675
WEST, C. D. N85-28457
WESTBERG, K. N85-28011
WESTBROOK, C. K. N85-28010
WHEADON, N. S. N85-28207
WHEELER, P. J. N85-28291
N85-28309
WHIPPLE, F. L. N85-28905
WHITAKER, A. N85-27889
WICHMANN, G. N85-27833
WICKENS, R. H. N85-27830
WICKSTROM, G. L. N85-28350
WIGGENRAAD, J. F. M. N85-28431
WILEMSKI, G. N85-28021
N85-28454
WILETS, L. N85-28761

WILHELM, K. N85-27860
N85-27887
WILLEKE, H. N85-27862
WILLEY, C. S. N85-27896
WILLIAMS, J. C. N85-27967
WILLIAMS, K. A. N85-28198
WILLSKY, A. S. N85-28391
WILMORE, D. N85-28729
WILSON, P. B. N85-28750
WINGLEE, R. M. N85-28907
WINKLER, G. M. R. N85-28300
N85-28303
WINTER, J. S. N85-27890
WITHINGTON, F. N. N85-28292
WOEST, W. N85-28338
WOJCICKI, S. N85-28765
WOLSKI, W. N85-27984
WON, D. J. N85-27863
WONG, H. V. N85-28803
WOOD, J. A. N85-28562
WOODFIN, G. N85-28347
WOODGER, J. R. N85-28294
WOODHOUSE, J. J. N85-28116
WOODMAN, R. W. N85-28548
WOYTOWITZ, P. J. N85-28621
WRIGHT, C. W. N85-27974
WRIGHT, S. M. N85-27904
WU, H. C. N85-28424
WU, S. C. N85-28306
WULF, F. N85-28258
WULFHEKEL, H. N85-27985
WYATT, G. C. F. N85-27911

X

XIAO-PEI, P. N85-28288

Y

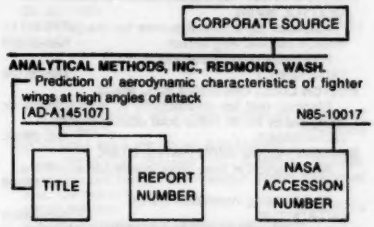
YABLOKOV, G. V. N85-28201
YAGER, S. N85-28551
N85-28552
YAMANE, H. L. N85-28512
YATSENKO, A. I. N85-28037
YATSIMIRSKII, V. K. N85-28055
YE, S. N85-27850
YETERIAN, V. H. N85-28784
YIN, Y. Q. N85-28673
YOKOBORI, Y. N85-28411
YOUNG, A. D. N85-27901
YU, F. T. S. N85-28791
YUN-RUI, M. N85-28268

Z

ZAIDMAN, I. D. N85-28085
ZAKHAROV, A. V. N85-28170
ZALUZEC, N. J. N85-28020
ZARECHENSKII, A. V. N85-28056
ZARETSKY, E. V. N85-28371
N85-28373
ZAVITSANOS, P. D. N85-28006
ZEGER, A. E. N85-28203
ZHANG, Z. N85-28248
ZHAO, F. N85-28248
ZHARNITSKII, M. D. N85-28032
ZHELEZNOV, L. P. N85-28164
ZIMMERMAN, J. T. F. N85-28284
ZLATKIS, A. N85-28332
ZRNIC, D. S. N85-28516
ZUHR, R. A. N85-28606
ZWICK, H. N85-28534

CORPORATE SOURCE INDEX

Typical Corporate Source Index Listing



Listings in this index are arranged alphabetically by corporate source. The title of the document provides the user with a brief description of the subject matter. The report number helps to indicate the type of document cited (e.g., NASA report, translation, NASA contractor report). The NASA accession number denotes the number by which the citation is identified. The titles are arranged under each corporate source in ascending accession number order.

A

ACADEMY OF SCIENCES (USSR), MOSCOW.
Explanation of Russian models: Saudi Arabian seismic refraction profile N85-28487

ACUREX CORP., MOUNTAIN VIEW, CALIF.
Development of mass-producible line-focus tracking concentrating solar collectors. Category 2: Control systems
[DE85-007873] N85-28459

ADMIRALTY MARINE TECHNOLOGY ESTABLISHMENT, TEDDINGTON (ENGLAND).
Numerical evaluation of low frequency sound propagation in layered media
[AD-A152690] N85-28728

ADVANCED TECHNOLOGY, INC., RESTON, VA.
DLA: Data/data base administration analysis
[AD-A153031] N85-28879

ADVISORY GROUP FOR AEROSPACE RESEARCH AND DEVELOPMENT, NEUILLY-SUR-SEINE (FRANCE).
Active Control Systems: Review, Evaluation and Projections
[AGARD-CP-384] N85-27883

AEROMARITIME SYSTEMBAU G.M.B.H., MUNICH (WEST GERMANY).
Development of a microprocessor controlled communication system for ships
[BMFT-FB-T-84-275] N85-28216

AERONAUTICAL RESEARCH ASSOCIATES OF PRINCETON, INC., N. J.
Parameterization of subgrid-scale fluxes in mesoscale meteorological models
[AD-A153016] N85-28523

AERONAUTICAL RESEARCH LABS., MELBOURNE (AUSTRALIA).
Flight trials of a modified gulfstream commander carrying external stores
[AD-A153376] N85-27859

AEROSPACE CORP., EL SEGUNDO, CALIF.
Study of the formation of sulfuric acid aerosols
[DE85-008102] N85-28011
Radiometer integrated into a communication terminal
[AD-A151746] N85-28195
The steering of GPS time N85-28301
Kalman filter estimates of the NAVSTAR satellite clock parameters N85-28315
IMS (International Magnetospheric Study) contributions to the understanding of auroral precipitation, transport, and particle sources
[AD-A152320] N85-28492
Optical waveguide characterization using grating couplers
[AD-A153063] N85-28789
The solar coronal X-ray spectrum 5.5-12 A
[AD-A152334] N85-28908

AEROSPACE MEDICAL RESEARCH LABS., WRIGHT-PATTERSON AFB, OHIO.
A study of error rates in voice recognition
[AD-A153282] N85-28211
A comparison of numeric data entry with touch-sensitive and conventional numeric keypads
[AD-A153276] N85-28598

AIR FORCE ENVIRONMENTAL TECHNICAL APPLICATIONS CENTER, SCOTT AFB, ILL.
Air Weather Service (AWS) climatic briefs: Europe
[AD-A152528] N85-28519

AIR FORCE INST. OF TECH., WRIGHT-PATTERSON AFB, OHIO.
Aerodynamic performance of a wing in ground effect using the PANAIR program
[AD-A153303] N85-27832
Investigation of heat transfer to a turbine blade cascade using a shock tube
[AD-A153090] N85-27871
Design of robust controllers for a multiple input-multiple output control system with uncertain parameters application to the lateral and longitudinal modes of the KC-135 transport aircraft
[AD-A153100] N85-27877
Incorporating control into the optimal structural design of large flexible space structures
[AD-A152858] N85-27937
Maximizing the semi-major axis for a freely coning solar sailcraft
[AD-A153175] N85-27938
Mathematical modeling and control of a large space structure as applied to a shuttle-antenna configuration
[AD-A153269] N85-27939
Solution to eigenvalue problems of antisymmetric cross-ply and antisymmetric angle-ply laminated plates using affine transformations
[AD-A153040] N85-27980
Strength and failure analysis of composite laminates with holes at room and elevated temperatures
[AD-A153263] N85-27981
Overload effects on sustained load crack growth at elevated temperature
[AD-A153223] N85-28091
A closed loop analysis of POGO instability
[AD-A153121] N85-28132
Effects of the corona wind on the cooling of a horizontal cylinder
[AD-A153101] N85-28241
Characteristics of a confined jet thrust vector control nozzle
[AD-A153087] N85-28268
Heating parameter estimation using coaxial thermocouple gages in wind tunnel test articles
[AD-A153039] N85-28328
Biaxial buckling of specially orthotropic, symmetric composite rectangular plates
[AD-A152958] N85-28417
Analytical shear buckling investigation of curved composite panels
[AD-A153138] N85-28421
Evaluation of interpolative modeling concepts for fatigue crack growth at elevated temperature
[AD-A153222] N85-28422
Forecast verification of the 10.7 centimeter solar flux and the Ap daily geomagnetic activity indices
[AD-A152959] N85-28499
Encapsulation and packaging of a semiconductor multielectrode array for cortical implantation
[AD-A153180] N85-28535
A test methodology for an automated and interactive software development environment
[AD-A152857] N85-28618
AFIT GKS: A GKS implementation in the Ada programming language
[AD-A152954] N85-28620
A modern control theory enhancement to an Interactive Control Engineering Computer Analysis Package (ICECAP)
[AD-A153249] N85-28622
The addition of advanced scene rendering techniques to a general purpose graphics package
[AD-A153323] N85-28625
Software environment for conducting interactive statistical analysis
[AD-A153378] N85-28626
Interfacing the VAX 11/780 using Berkeley Unix 4.2 BSD and Ethernet based Xerox network systems, volume 1
[AD-A152953] N85-28645
Interfacing the VAX 11/780 using berkeley UNIX 4.2BSD and Ethernet based Xerox Network Systems
[AD-A153174] N85-28647
Scalar modal control of a nonlinear system using time varying gain
[AD-A153252] N85-28676
A proportional-plus-integral controller for a particle beam weapon
[AD-A153213] N85-28778
Construction and analysis of a PRIZ spatial light modulator exhibiting dynamic image selection
[AD-A152318] N85-28787
Speed-up techniques for complementary metal oxide semiconductor very large scale integration
[AD-A152466] N85-28829
Complete development and implement AFIT/ENG database management system, volume 1
[AD-A153043] N85-28866

AIR FORCE SYSTEMS COMMAND, WRIGHT-PATTERSON AFB, OHIO.
The R-609 radio set
[AD-A152370] N85-28200
Mobile television radio link
[AD-A152381] N85-28201
Digital methods of the optimum processing of radar signals
[AD-A152469] N85-28202
Research on design of cryotransformers and its prospects for the future
[AD-A152400] N85-28230
Meteorology and food production: The theme of the 16 meteorology day
[AD-A152372] N85-28516

AIR FORCE TECHNICAL APPLICATIONS CENTER, PATRICK AFB, FLA.
Results from radiation monitoring equipment experiment on STS-11
[AD-A152531] N85-27932
Results from radiation monitoring equipment experiment on STS-8
[AD-A153241] N85-28911

AIR FORCE WRIGHT AERONAUTICAL LABS., WRIGHT-PATTERSON AFB, OHIO.
Use of quaternions in flight mechanics
[AD-A152616] N85-27875
The STOL and maneuver technology program integrated control system development N85-27910
Proceedings of the 9th US Air Force and the Federal Republic of Germany Data Exchange Agreement Meeting. Viscous and Interacting Flow Field Effects
[AD-A153020] N85-28266
Air Force technical objective document FY 86
[AD-A152730] N85-28655

AIR PRODUCTS AND CHEMICALS, INC., ALLENTOWN, PA.
Catalyst and reactor development for a liquid phase Fischer-Tropsch process
[DE85-005894] N85-28014

ALABAMA UNIV., BIRMINGHAM.
Fuzzy hierarchical analysis
[DE85-008149] N85-28685

ALBERTA UNIV., EDMONTON.
Nucleon-nucleon program at TRIUMF
[DE85-900430] N85-28756

ALLIED BENDIX AEROSPACE, KANSAS CITY, MO.
The definition and computation of a metric on plane curves. The meaning of a face on a geometric model N85-28571

ALLIED CHEMICAL CORP., MORRISTOWN, N.J.
Vibrational spectra of a-Fe(.78)P(.22) by inelastic neutron scattering
[DE85-008298] N85-28016

AMERICAN INST. OF BIOLOGICAL SCIENCES, ARLINGTON, VA.
Biological and human health effects of extremely low frequency electromagnetic fields. Post-1977 literature review
[AD-A152731] N85-28539
AMERICAN UNIV., WASHINGTON, D. C.
Possible indication of an A-dependence of R in deep-inelastic electron scattering from nuclei
[DE85-008174] N85-28763
Social and political problems in Soviet basic research
[AD-P004565] N85-28860
ANAMET LABS., INC., SAN CARLOS, CALIF.
Sample problems for STAGSC-1
[AD-A153142] N85-28621
APPLIED SYSTEMS INST., INC., WASHINGTON, D.C.
Avionics data base
[AD-A152415] N85-27863
ARGONNE NATIONAL LAB., ILL.
Flow-induced vibration of SSME main injector liquid-oxygen posts N85-27951
Effects of high mean stress on high-cycle fatigue behavior of PWA 1480 N85-27964
Fracture toughness of MgCr(sub)2O(sub)4-ZrO(sub)2
[DE85-007945] N85-27982
Vibrational spectra of a-Fe(.78)P(.22) by inelastic neutron scattering
[DE85-008298] N85-28016
Digital filters for application to data analysis in electron energy loss spectroscopy
[DE85-007932] N85-28020
In situ HVEM studies of electron beam-driven composition changes in thin film alloys: Displacement-rate gradient effects
[DE85-007992] N85-28092
Design of the waveguide for microwave heating of solid lithium ceramic blankets
[DE85-009776] N85-28120
Ceramic turbochargers: A case study of a near-term application of high-strength ceramics
[DE85-006495] N85-28379
Future of ceramic turbochargers: Promises and pitfalls
[DE85-006209] N85-28380
DOE/ANL/HTRI heat exchanger tube vibration data bank: Addendum 5
[DE85-007730] N85-28425
Oxygen isotopic study of the oxidation of SO2 by H2O2 in the atmosphere
[DE85-004017] N85-28468
Software for estimating sparse Hessian matrices
[DE85-008121] N85-28629
An Impurity Control Test Facility (ICTF) for the study of fusion reactor/plasma edge materials
[DE85-007946] N85-28810
Adsorption of Hg on lunar samples
[DE85-007948] N85-28906
ARIZONA STATE UNIV., TEMPE.
Terrestrial photovoltaic power systems with sunlight concentration
[DE85-008396] N85-28464
The effect of ion-bombardment-induced atomic mixing on depth-profiling of interfaces
[AD-A153199] N85-28834
Computing in the Soviet general economy: An introductory overview
[AD-P004563] N85-28858
ARIZONA UNIV., TUCSON.
Photoionization mass spectrometry with VUV hydrogen laser source
[AD-A153362] N85-28009
Techniques for operating Charge Coupled Devices (CCD's) in very high speed framing mode
[AD-A152878] N85-28236
Construction techniques of a molecular hydrogen laser
[AD-A152928] N85-28343
Structural analysis of terrane accretions in the eastern Brooks Range and adjacent areas in central Alaska and Canada
[DE85-008279] N85-28501
ARMY ARMAMENT RESEARCH AND DEVELOPMENT COMMAND, WATERVLIET, N. Y.
Thermal expansion effects in electrical transport in amorphous metals
[AD-A152477] N85-28089
Cyclic torsion of a circular cylinder and its residual stress distribution
[AD-A153347] N85-28424
ARMY COMMUNICATIONS-ELECTRONICS COMMAND, FORT MONMOUTH, N.J.
A transport theory of millimeter wave propagation in woods and forests
[AD-A151683] N85-28196
ARMY ELECTRONICS TECHNOLOGY AND DEVICES LAB., FORT MONMOUTH, N. J.
Crystal resonator/oscillator test facility and test results N85-28322
ARMY ENGINEER WATERWAYS EXPERIMENT STATION, VICKSBURG, MISS.
A discussion of adaptive grids and their applicability in numerical hydrodynamic modeling
[AD-A151843] N85-28659
ARMY RESEARCH INST. FOR THE BEHAVIORAL AND SOCIAL SCIENCES, ALEXANDRIA, VA.
Biofeedback and performance: An update
[AD-A153228] N85-28553
Verbal information processing paradigms: A review of theory and methods
[AD-A153229] N85-28880
ARMY STRUCTURES LAB., HAMPTON, VA.
Friction and wear behavior of aluminum and composite I-beam stiffened airplane skins
[NASA-TM-86418] N85-27852
ARMY TEST AND EVALUATION COMMAND, ABERDEEN PROVING GROUND, MD.
Distance Measuring Equipment (DME), general
[AD-A152585] N85-27846
ARNOLD ENGINEERING DEVELOPMENT CENTER, ARNOLD AIR FORCE STATION, TENN.
High resolution spectroscopy of C13O16 in gas mixtures
[AD-A152625] N85-27991
ASTRONOMISCHE RECHEN-INSTITUT, HEIDELBERG (WEST GERMANY).
Study of the accuracy of astrometric observations of comets
[ESA-CR(P)-1964] N85-28903
ATMOSPHERIC AND ENVIRONMENTAL RESEARCH, INC., CAMBRIDGE, MASS.
Cometary atmospheres: Modeling the spatial distribution of observed neutral radicals
[NASA-CR-175882] N85-28904
AUBURN UNIV., ALA.
The decomposition of gas phase formaldehyde by plasma discharge
[AD-A153202] N85-28007
AUSTRON, INC., AUSTIN, TEX.
The measurement of linear frequency drift in oscillators N85-28316
AVCO-EVERETT RESEARCH LAB., MASS.
Experimental study of dissociative attachment in optically-pumped lithium molecules
[AD-A152800] N85-28738
AVIONS MARCEL DASSAULT-BREGUET AVIATION, SAINT-CLOUD (FRANCE).
The interactive generation of specifications for an onboard software series (GISELE) N85-27906

B

BALL AEROSPACE SYSTEMS DIV., BOULDER, COLO.
Shuttle-tethered satellite system definition study extension
[NASA-CR-171473] N85-27923
Shuttle-tethered satellite system definition study. Volume 1: Executive study
[NASA-CR-171474] N85-27924
BALLISTIC RESEARCH LABS., ABERDEEN PROVING GROUND, MD.
Measurement of Franck-Condon factors for the v'=0 progression in the B-X system of PO
[AD-A152734] N85-27993
Photochemical ignition studies. 1: Laser ignition of flowing premixed gases
[AD-A153048] N85-28002
Liquid propellants for use in guns: A review
[AD-A153051] N85-28131
Navier-Stokes computational study of axisymmetric transonic turbulent flows with a two-equation model of turbulence
[AD-A152653] N85-28265
BATTELLE COLUMBUS LABS., OHIO.
Composite loads spectra for select space propulsion structural components: Probabilistic load model development N85-27954
Hydrogen degradation of pipeline steels
[DE85-008930] N85-28101
Study of raster metafile formats
[AD-A153322] N85-28624
BATTELLE INST., FRANKFURT AM MAIN (WEST GERMANY).
Research and developmental study on MIS thin film solar cells of amorphous hydrogenated silicon, part 2
[BMFT-FB-T-84-290] N85-28467
BAYER A.G., KREFELD (WEST GERMANY).
New air-curing lacquer systems with high solids content
[BMFT-FB-T-85-005] N85-28124
BENDIX CORP., KANSAS CITY, MO.
Microprocessor controlled temperature chassis
[DE85-006392] N85-28602
BENDIX CORP., MISHAWAKA, IND.
Hardware test program for evaluation of baseline range/range rate sensor concept
[NASA-CR-175910] N85-28194
BOEING COMPUTER SERVICES CO., SEATTLE, WASH.
The construction of curves and surfaces using numerical optimization techniques N85-28565
BOEING MILITARY AIRPLANE DEVELOPMENT, SEATTLE, WASH.
Automatic flight control modes for the AFTI/F-111 mission adaptive wing aircraft N85-27909
Fuel freeze point investigations
[AD-A152801] N85-28129
BOSTON COLL., CHESTNUT HILL, MASS.
Electron and ion distributions at high latitudes as measured by the Air Force polar orbiting satellites
[AD-A153242] N85-28500
BRIGHAM YOUNG UNIV., PROVO, UTAH.
A comparison of three curve intersection algorithms N85-28592
Manufacturing information system
[AD-A152715] N85-28616
BRITISH AEROSPACE AIRCRAFT GROUP, BROUGH (ENGLAND).
ACT flight research experience N85-27894
BRITISH AEROSPACE PUBLIC LTD. CO., BROUGH (ENGLAND).
A modular dissimilar redundant computer designed for high integrity control N85-27904
BRITISH AEROSPACE PUBLIC LTD. CO., LANCASHIRE (ENGLAND).
An update of experience on the fly by wire Jaguar equipped with a full-time digital flight control system N85-27893
BRITISH LIBRARY LENDING DIV., BOSTON SPA (ENGLAND).
Multi-phase crystallization of ferrous alloys
[BLL-BISI-TRANS-22441-(9022.06)] N85-28037
Anticorrosion protection of reinforcing steel in prestressed gypsum and anhydrite concrete
[BLL-BISI-TRANS-22079-(9022.06)] N85-28044
Exhaust systems for passenger vehicles: Test procedure for resistance to internal corrosion of silencers
[BLL-BISI-TRANS-22360-(9022.06)] N85-28361
BROOKHAVEN NATIONAL LAB., UPTON, N. Y.
High resolution powder diffraction
[DE85-008287] N85-28015
Properties of nitrogen containing stainless alloy designed for high resistance to pitting
[DE85-008282] N85-28095
Hydrogen degradation of pipeline steels
[DE85-008930] N85-28101
Development of concrete polymer materials
[DE85-005957] N85-28114
Laser plasma LINAC
[DE85-008294] N85-28348
Experiments and detectors for high energy heavy ion colliders
[DE85-007927] N85-28748
Transverse electron resonance accelerator
[DE85-008289] N85-28758
Alternating gradient synchrotron
[DE85-005950] N85-28759
Heavy ion physics at BNL, the AGS and RHIC
[DE85-005951] N85-28760
Stability in dynamical systems
[DE85-006698] N85-28766
Large, energetic cluster impacts on surfaces
[DE85-006559] N85-28769
Extension of the consistent Q formalism to odd-A nuclei in the W-Pt region
[DE85-008284] N85-28770
Elementary particle theory
[DE85-006803] N85-28771
BROWN UNIV., PROVIDENCE, R. I.
Critical conditions for failure in materials subjected to high rates of loading
[AD-A153135] N85-28420
Silica problem in the design of geothermal power plants
[DE85-008245] N85-28453
Distributed memory
[AD-A153364] N85-28554
Language design, computers and brains
[AD-A152819] N85-28594
BRUNEL UNIV., UXBRIDGE (ENGLAND).
Shape preserving spline interpolation N85-28564
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[AD-A153302] N85-28008
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[DE85-007654] N85-28097
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[DE85-007656] N85-28098
Erosion of corrosion-resistant surface treatments on alloy steels
[DE85-008446] N85-28100
Bifunctional oxygen electrodes
[DE85-006871] N85-28248
Experiments with light ions at CERN super proton synchrotron
[DE85-007625] N85-28744
Cluster production and entropy
[DE85-007626] N85-28752
Report of the Working Group on Other Acceleration Schemes
[DE85-008447] N85-28764
Heavy ion fusion accelerator research in the US
[DE85-008465] N85-28767
Proposal for the systematic naming of mesons and baryons
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[DE85-004424] N85-28010
Electrodes for flash discharge lamps
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[DE85-007246] N85-28251
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[DE85-008896] N85-28252
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[DE85-007252] N85-28334
Support structures for optical components in the Laser Demonstration Facility
[DE85-008879] N85-28349
Integrating quality assurance and research and development
[DE85-007974] N85-28592
Aluminum-air power cell research and development
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Tracking algorithm performance analysis program (TRAPP)
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VULTURE manual
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A numerical study of the mean trajectory approximation in a non-adiabatic process
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Experimental measurements and analysis of heat transfer and gas dynamics in a rotating turbine stage N85-27949
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[NASA-CR-175894] N85-28658
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[CWI-CS-R8415] N85-28139
Algebra of communicating processes
[CWI-CS-R8421] N85-28214
Tidal rectification in lateral viscous boundary layers of a semienclosed basin
[CWI-AM-R8415] N85-28284
The dynamical behavior of the age-size-distribution of a cell population
[CWI-AM-R8414] N85-28538
A secure high-speed transaction protocol
[CWI-CS-R8417] N85-28605
Counting is easy
[CWI-CS-R8423] N85-28606
A complete inference system for regular processes with silent moves
[CWI-CS-R8420] N85-28638
Towards a uniform topological treatment of streams and functions on streams
[CWI-CS-R8422] N85-28639
The design of a capability-based distributed operating system
[CWI-CS-R8418] N85-28650
Distributed systems management in wide area networks
[CWI-CS-R8419] N85-28651
Distributed matchmaking for processes in computer networks
[CWI-CS-R8421] N85-28652
Distributed elections in a ring of processors using Archimedean time
[CWI-CS-R8416] N85-28653
A convolution integral equation solved by Laplace transformation
[CWI-AM-R8409] N85-28692
A class of polynomials related to those of Laguerre
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Uniform asymptotic expansions of integrals
[CWI-AM-R8412] N85-28694
Dynamical systems and numerical integration
[CWI-AM-R8413] N85-28695
On the algebraic equations in implicit Runge-Kutta methods
[CWI-NM-R8413] N85-28696
A program for solving first kind Fredholm integral equations by means of regularization
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D

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[AD-D011640] N85-27865
Spacer structure
[AD-D011641] N85-27866
Titanium metal-matrix composites
[AD-D011643] N85-28086
Polyaromatic ether-sulfone-keytones with fluoro-substituted-p-cyclophane units as cross-linking sites
[AD-D011649] N85-28105
Survivable ground base sensor
[AD-D011647] N85-28213
Multiconductor flat cable
[AD-D011635] N85-28218
Heat resistant sheathed insulated electrical conductors
[AD-D011644] N85-28219
Cut angles for quartz crystal resonators
[AD-D011652] N85-28220
Pipelined programmable charge domain device
[AD-D011598] N85-28225
Heat pipe and method of making same
[AD-D011654] N85-28273
Printed wiring board circuit isolator tool
[AD-D011638] N85-28333
Jinc-trap resonator
[AD-D011650] N85-28339
Apparatus for etching vertical junction solar cell wafers
[AD-D011653] N85-28443
Snow Scale/Rate meter
[AD-D011648] N85-28505
Stabilizing force feedback in bio-actuated control systems
[AD-D011634] N85-28560
Generation and display apparatus
[AD-D011639] N85-28599
Optical system for measuring shadowgraph data
[AD-D011642] N85-28784
Spatial light modulator having a capacitively coupled photoconductor
[AD-D011646] N85-28790
System of white-light density pseudocolor encoding with three primary colors
[AD-D011651] N85-28791
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[DFVLR-MITT-84-20] N85-27850
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[DFVLR-MITT-85-01] N85-27864
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[DFVLR-FB-84-12] N85-27880
Identification of gust input and gust response characteristics from Do 28 TNT flight test data
[DFVLR-FB-84-48] N85-27881
Proposals for the determination of necessary elevator handling characteristics of sailplanes in high speed range
[DFVLR-FB-84-52] N85-27882
Aspects of application of ACT systems for pilot workload alleviation N85-27887
Measurements of laser gyro errors as a function of the beam path
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[DFVLR-IB-222-84-A-37] N85-27912
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[DFVLR-FB-84-46] N85-28285
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[DFVLR-FB-84-50] N85-27862
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[DFVLR-MITT-85-03] N85-27921
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[DFVLR-FB-85-07] N85-28215
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[DFVLR-FB-85-06] N85-28442
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[DFVLR-FB-85-03] N85-28471
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[DFVLR-FB-85-09] N85-28472
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[DFVLR-MITT-84-02] N85-28503
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GENERAL ELECTRIC CO., BINGHAMTON, N.Y.
The state-of-the-art and future of flight control systems N85-27885
GENERAL ELECTRIC CO., PHILADELPHIA, PA.
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[AD-A153198] N85-28006
GENERAL MOTORS CORP., INDIANAPOLIS, IND.
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[NASA-CR-174715] N85-28109
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A comparison of crustal sections: Arabian Shield to the Red Sea N85-28491
GEORGIA INST. OF TECH., ATLANTA.
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Constitutive cyclic deformation behavior in single-crystal and directionally solidified SSME high-pressure fuel turbopump airfoil materials N85-27965
GEORGIA UNIV., ATHENS.
Chemical applications of topology and group theory. 17: An information theoretical approach to polyhedral symmetry
[AD-A152821] N85-27995
A study of excitations during collisionally-induced electron detachment of negative ions
[AD-A152979] N85-28739
Theoretical studies of heavy ion scattering processes
[DE85-008823] N85-28753
GESAMTHOCHSCHULE, SIEGEN (WEST GERMANY).
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GKSS-FORSCHUNGSZENTRUM GEESTHACHT (WEST GERMANY).
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[GKSS-84/E/53] N85-28434
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[AD-A152888] N85-27979
GRUMMAN AIRCRAFT ENGINEERING CORP., BETHPAGE, N. Y.
X-29 digital flight control system design N85-27889

H

HAHN-MEITNER-INSTITUT FUER KERNFORSCHUNG, BERLIN (WEST GERMANY).
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[HMI-B-353-VOL-3] N85-28258
HAMILTON STANDARD, WINDSOR LOCKS, CONN.
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[NASA-CR-174747] N85-28372
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[DE85-007462] N85-26094
HARVARD UNIV., CAMBRIDGE, MASS.
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[AD-A152661] N85-28233
Efficient parallel solution of linear systems
[AD-A152663] N85-28663
HEWLETT-PACKARD LABS., PALO ALTO, CALIF.
Close encounters with S/T (science and technology) in the Soviet Union
[AD-P004570] N85-28864
HOKENSON (GUSTAVE J.), LOS ANGELES, CALIF.
Coherent structure reflective turbulent viscous flow modeling
[AD-A153086] N85-28267
HOUSTON UNIV., TEX.
An ultrasensitive and element specific photoionization detection system for environmental analysis
[AD-A153365] N85-28332
HOWARD UNIV., WASHINGTON, D. C.
Communications and logic systems at millimeter wave frequencies
[NASA-CR-175859] N85-28824
Communications and logic systems at millimeter wave frequencies, summary N85-28825
Leakage effects in n-GaAs MESFET with n-GaAs buffer layer N85-28826
GaAs MESFET with lateral non-uniform doping N85-28827
HUGHES AIRCRAFT CO., TORRANCE, CALIF.
Continued development and testing of tungsten controlled porosity dispenser cathodes
[AD-A152595] N85-28090
HUGHES RESEARCH LABS., MALIBU, CALIF.
Low voltage free electron laser development
[AD-A152917] N85-28342
Materials-process interactions in ternary alloy semiconductors
[AD-A153133] N85-28832

I

IBM WATSON RESEARCH CENTER, YORKTOWN HEIGHTS, N.Y.
Numerical methods for stiff ordinary and elliptic partial differential equations
[AD-A153247] N85-28675
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[AD-A153268] N85-28245

ILLINOIS UNIV., URBANA.
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[AD-A153264] N85-28244
Fatty and aromatic acid catabolizing bacteria from methanogenic ecosystems
[DE85-008133] N85-28537
Restrike particle beam experiments on a dense plasma focus. Opening switch research on a dense plasma focus
[AD-A152991] N85-28802
INDIAN SPACE RESEARCH ORGANIZATION, AHMEDABAD.
Time synchronization experiments with APPLE N85-28323
INFORMATION AND CONTROL SYSTEMS, INC., HAMPTON, VA.
Solar radiance models for determination of ERBE scanner filter factor
[NASA-CR-172595] N85-28513
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High temperature composite thermal storage systems
[DE85-005073] N85-28455
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[INPE-3316-NTE/227] N85-28613
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[IRI-190-83-07] N85-28774
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[IRI-190-83-12] N85-28775
IOWA STATE UNIV. OF SCIENCE AND TECHNOLOGY, AMES.
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New examples of clusters, extended metal-metal bonding and interstitial derivatives
[DE85-005926] N85-28637
IOWA UNIV., IOWA CITY.
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[AD-A152714] N85-28496
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[AD-A152674] N85-28733
IVECO, INC., HUNTINGTON BEACH, CALIF.
Commercialization of the power factor controller
[NASA-CR-171500] N85-28221

J

JAYCOR, ALEXANDRIA, VA.
Design and testing of a high power quasi-optical gyrotron
[AD-A153212] N85-28330
JET PROPULSION LAB., CALIFORNIA INST. OF TECH., PASADENA.
Performance analysis of the DSN baseband assembly (Bba) Real-Time Combiner (RTC)
[NASA-CR-175878] N85-28190
Microwave responses of the western North Atlantic
[NASA-CR-175888] N85-28191
A software simulation study of a (255,223) Reed-Solomon encoder-decoder
[NASA-CR-175872] N85-28192
Performance analysis of the DSN baseband assembly (Bba) Real-Time Combiner (RTC)
[NASA-CR-175877] N85-28193
Thermal Infrared Multispectral Scanner (TIMS): An investigator's guide to TIMS data
[NASA-CR-175875] N85-28286
First results of GPS time transfer to Australia N85-28294
The role of a low Earth orbiter in intercontinental time synchronization via GPS satellites N85-28306
The superconducting cavity stability ruby maser oscillator N85-28324
Activity and accomplishments of dish/Stirling electric power system development
[NASA-CR-175841] N85-28445
Relative potentials of concentrating and two-axis tracking flat-plate photovoltaic arrays for central-station applications
[NASA-CR-175889] N85-28446
Parabolic dish test site: History and operating experience
[NASA-CR-175892] N85-28447
Documents of the JPL Photovoltaics Program Analysis and Integration Center: An annotated bibliography
[NASA-CR-175873] N85-28448
A program for the calculation of paraboloidal-dish solar thermal power plant performance
[NASA-CR-175874] N85-28449
Electrical research on solar cells and photovoltaic materials
[NASA-CR-175897] N85-28452
Homogeneous processes of atmospheric interest
[NASA-CR-175770] N85-28475
Water vapor radiometry research and development phase
[NASA-CR-175887] N85-28512
Towards a study of synoptic-scale variability of the California current system
[NASA-CR-175871] N85-28529
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[NASA-CR-175890] N85-28559
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JOHNS HOPKINS UNIV., BALTIMORE, MD.
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[AD-A153172] N85-28833
Technology and Soviet political choices
[AD-P004566] N85-28861
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[AD-A152993] N85-27999
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Test flight of IL-76TD long-range transport variant N85-27842
USSR report: Engineering and equipment
[JPRS-UEQ-85-004] N85-28142
High-altitude testing of selective optical coatings for solar radiators and collectors N85-28143
Selective coatings for solar heat converters N85-28144
Flat magnetohydrodynamic induction pump N85-28145
Dependence of characteristics of centrifugal magnetohydrodynamic conduction pump on electrical conductance of end walls. Part 1: Experiment N85-28146
Vibrations of rotors connected through couplings with backlash N85-28147
Precision die forging of blades or gas turbines N85-28148
Stressed-strained state of tightening buckles in sectional runners of gas turbines N85-28149
Calculation of friction at spherical bearing journals in turbomachines N85-28150
Self-scanning MDS-integrated photosensor strip N85-28151
Holographic intensity correlator with PRIS-type photoelectro-optical controlled transparency N85-28152
Holographic corrector in objective with compound main mirror N85-28153
Performance evaluation of fiber-optic converters N85-28154
Characteristics of steady-state hypersonic flow about blunted bodies with discontinuities in generators N85-28155
Impact starting of plane nozzles with wide divergence angle N85-28156
Buildup of oscillation of bodies in stratified fluid N85-28157
Supersonic flow around blunt wedge N85-28158
Propulsion efficiency of vibrating bodies in subsonic gas stream N85-28159
Stefan-Maxwell relations for plasma diffusion currents in magnetic field N85-28160
Method of calculating separation flow of subsonic gas stream around wings N85-28161
Supersonic flow around weak radiation sources N85-28162
Elastic equilibrium of composite shells with finite shear rigidity N85-28163
Stability of cylindrical shells with variable thickness under external pressure N85-28164
Natural vibrations of reinforced spherical shells N85-28165
Numerical solution of one-dimensional nonlinear problems of statics for elastic beams and shells under rigid constraints N85-28166
Method of solving problems of statics for multilayer shells of revolution N85-28167
Scattering of sounds by piezoceramic cylindrical shell near rigid surface N85-28168
Propagation of non-axisymmetric elastic waves through shell with filler under radial load at one end N85-28169
Acoustic oscillations of rods and plates N85-28170
NMR manometer for measuring high pressures at liquid-helium temperatures N85-28171
Principles of designing digital compensating accelerometers N85-28172
Uniaxial angular accelerometers N85-28173
Technological apparatus for laser treatment of materials N85-28174
Apparatus for measuring velocity of sound in fluids N85-28175
Liquid-metal transducers for strain measurement during in-pile materials testing N85-28176
East Europe report: Science and technology
[JPRS-ESA-85-017] N85-28177
Proton induced X-ray emission method, its application in analytics N85-28178
Goals, achievements of microelectronics program N85-28179
Uses of, experiences in production of custom designed IC's N85-28180
Modern equipment for manufacture of IC's in Hungary N85-28181
Progress, goals in biotechnology summarized N85-28182
West Europe report: Science and technology
[JPRS-WST-84-024] N85-28183
Finland, Sweden cooperate in composites research N85-28184
Structure of SYLDA double launch system for Ariane N85-28185
Robots, automatic devices inside VW's Wolfsburg plant N85-28186
Future directions of robotics, automation in Italy N85-28187
USSR report: Machine tools and metalworking equipment
[JPRS-UMM-84-014] N85-28188
Applications of robots in machine tool industry reviewed N85-28189
USSR report: Science and technology policy
[JPRS-UST-85-008] N85-28872
Organization of scientific, technical information services N85-28873
Academician Ovchinnikov on future of bioorganic chemistry N85-28874
General laws of development of technology N85-28875

K

KARLSRUHE UNIV. (WEST GERMANY).
Interpretation of the data of USGS seismic refraction profile across the Arabian Shield in western Saudi Arabia N85-28488
KEMA (N. V.), ARNHEM (NETHERLANDS).
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KERNFORSCHUNGSANLAGE, JUELICH (WEST GERMANY).
Hot Isostatic Pressing (HIP): Techniques, applications and economical use
[JUEL-SPEZ-288] N85-28141
A programming system for a modular flexible multimicrocomputer system for the automatic control of automated test equipment
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Origin, processing, and dissemination of scientific news, with examples from 20 research institutes
[JUEL-1940] N85-28882
KIEL UNIV. (WEST GERMANY).
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KODE, INC., TUSTIN, CALIF.
UHF IRIG G distribution system N85-28308

L

L N K CORP., INC., SILVER SPRING, MD.
Further study of digital matching of dissimilar images [AD-A153112] N85-26672

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Methods for optimal recursive estimation of non-stationary time series, applications to atomic time and frequency metrology N85-28312

LANCASTER UNIV., BAILRIGG (ENGLAND).
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LEHIGH UNIV., BETHLEHEM, PA.
Preparation of polystryene latex particles in a rotating reactor [NASA-CR-171475] N85-28108
Vortices in non-Newtonian fluids [AD-A153169] N85-28269

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A preliminary examination of the 1978 refraction profiles in Saudi Arabia N85-28482

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M-BLASER: A device to study pursuit tracking in the rhesus monkey [AD-A152986] N85-28534
Pursuit tracking performance and flash disruption: The effects of training the non-dominant eye on target reacquisition [AD-A153404] N85-28541

LINCOLN LAB., MASS. INST. OF TECH., LEXINGTON.
Wideband integrated voice/data technology [AD-A152329] N85-28197
Restructurable VLSI (Very large scale integration) program [AD-A152340] N85-28226
The design of an adaptive predictive coder using a single-chip digital signal processor [AD-A152461] N85-28231
Research on superconductive signal-processing devices [AD-A152703] N85-28235
Weather radar studies [AD-A152563] N85-28521
InP materials [AD-A152341] N85-28828

LITTON GUIDANCE AND CONTROL SYSTEMS, WOODLAND HILLS, CALIF.
Physics element design aspects for a tactical rubidium frequency standard N85-28321

LIVERPOOL UNIV. (ENGLAND).
Recent progress in the dynamic plastic behaviour of structures, part 4 N85-28402

LOCKHEED-CALIFORNIA CO., BURBANK.
Demonstration of relaxed static stability on a commercial transport N85-27898

LOCKHEED MISSILES AND SPACE CO., PALO ALTO, CALIF.
Long life feasibility study for the shuttle infrared telescope facility [NASA-CR-3722] N85-28893

LONDON UNIV. (ENGLAND).
The aerodynamics of control N85-27901

LOS ALAMOS SCIENTIFIC LAB., N. MEX.
Historical perspective on the Moon base: The British perspective [DE85-005905] N85-27925
Resonator optical designs for free electron lasers [DE85-007678] N85-28347
Performance of an active/passive hybrid solar system utilizing vapor transport [DE85-008627] N85-28466
Examination of the circle spline routine N85-28573
Projected discrete ordinates methods for numerical transport problems [DE85-005632] N85-28678
Augmented weighted diamond force of the linear nodal scheme for Cartesian coordinate systems [DE85-005631] N85-28679
Modern test of chiral anomalies [DE85-005892] N85-28680
Spatial differencing for finite difference codes [DE85-008902] N85-28684
Incorporation of Monte Carlo electron interface studies into photon general cavity theory [DE85-007674] N85-28772
Fluid modeling of magnetized plasmas [DE85-007679] N85-28804
Analysis of nonlinear parabolic equations modeling plasma diffusion across a magnetic field [DE85-007883] N85-28807
Two-dimensional TBR calculations for conceptual compact reversed-field pinch reactor blanket [DE85-007636] N85-28812
X-ray emission and the winds of cataclysmic variables [DE85-007663] N85-28902

LOUISIANA STATE UNIV., BATON ROUGE.
Clusters of transition metal atoms [AD-A153126] N85-28740

M

MARC ANALYSIS RESEARCH CORP., PALO ALTO, CALIF.
Probabilistic finite element development N85-27956

MARTIN MARIETTA ENERGY SYSTEMS, INC., OAK RIDGE, TENN.
Support structures for optical components in the Laser Demonstration Facility [DE85-008879] N85-28349

MARYLAND UNIV., COLLEGE PARK.
CLEANROOM software development: An empirical evaluation [AD-A152924] N85-28619
Deconvolution methods for multi-sensors [AD-A152351] N85-28660
Effects of inspection errors on curtailed Dorfman-type procedures [AD-A152376] N85-28699
Statistical effects of imperfect inspection sampling. Part 2: Double sampling, link sampling and grading [AD-A152377] N85-28700

MASCHINENFABRIK AUGSBURG-NUERNBERG A.G., MUNICH (WEST GERMANY).
The Ariane launch vehicle is the key of the Europeans to the space market N85-27931

MASSACHUSETTS INST. OF TECH., CAMBRIDGE.
Electrons and grain boundary energies in metals [DE85-009530] N85-28099
Optimally robust redundancy relations for failure in uncertain systems [NASA-CR-175953] N85-28391
Fatigue of synthetic fibers for marine rope applications [MIT-R84-2] N85-28414
Fatigue behavior of synthetic fibers, yarns and ropes N85-28415
The effects of sea water and concentrated salt solutions on the fatigue of nylon 6,6 fibers N85-28416
Influence of materials creep on rotor dynamics [DE85-008545] N85-28426
The design of megawatt gyrotrons [DE85-007892] N85-28754

MATERIALPRUEFUNGSANSTALT, STUTTGART (WEST GERMANY).
Investigation of reaction layer formation in high-load capacity lubricating oils [MPA-83-01] N85-28381

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Examination of a method for predicting the properties of railgun plasmas [AR-004-322] N85-28799

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Solar wind observations associated with a slow forward shock wave at 0.31 AU [MPAE-W-79-84-46] N85-28909

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Special topics in infrared interferometry [NASA-TM-87472] N85-28794
Observation of the Crab nebula in the hard X-ray [MPE-186] N85-28897
Activities report of the Institute for Extraterrestrial Physics [MPI-PAE/EXTRATERR-187] N85-28898
Balloon-borne, He-cooled Fourier transform spectrometer for far infrared astronomy [MPE-IR-41] N85-28899

MCDONNELL AIRCRAFT CO., ST. LOUIS, MO.
Controller requirements for uncoupled aircraft motion, volume 1 [AD-A153173] N85-27878
Controller requirements for uncoupled aircraft motion, volume 2 [AD-A153300] N85-27879
Operational and developmental experience with the F/A-18A digital flight control system N85-27895

MCELROY (RALPH) CO., AUSTIN, TEX.
Process for making electrodes for discharge tubes [DE85-006898] N85-28247
Electrodes for flash discharge lamps [DE85-006897] N85-28250
Electrode for flash discharge lamps [DE85-006896] N85-28252

MESSERSCHMITT-BOELKOW-BLOHM G.M.B.H., HAMBURG (WEST GERMANY).
Realisation of relaxed static stability on a commercial transport N85-27899

MESSERSCHMITT-BOELKOW-BLOHM G.M.B.H., MUNICH (WEST GERMANY).
Activities in aerospace N85-27821
Some flight test results with redundant digital flight control systems N85-27892
The flight control system for the Experimental Aircraft Programme (EAP) demonstration aircraft N85-27908

MESSERSCHMITT-BOELKOW-BLOHM G.M.B.H., OTTOBRUNN (WEST GERMANY).
Development of a fuselage forward section in Carbon Fiber Reinforced Plastic (CFRP) type of construction [MBB/LFA34/CFK/PUB/008] N85-27851
European utilization aspects of a US manned space station, volume 1 [ESA-CR(P)-1987-VOL-1] N85-27926
European utilization aspects of a US manned space station, volume 2 [ESA-CR(P)-1987-VOL-2] N85-27927
Integral profile method for production of carbon fiber sheets [MBB/LFA34/CFK/PUB/006] N85-27975
Heat resistant Carbon Fiber Reinforced Plastics (CFRP) hardening equipment [MBB/LFA33/CFK/PUB/007] N85-27976
Development of new circuit symbols for binary logic elements [MBB-Z-39/85-O] N85-28640

METALS SOCIETY, LONDON (ENGLAND).
Weldability of micro-alloy steels as reaction of structure and inclusions [BLL-BISI-TRANS-22196-(9022.06)] N85-28027
Local heat treatment of welded joints of pipes and rotary vessels N85-28028
Mechanical properties of polycrystalline alpa titanium [BLL-BISI-TRANS-21923-(9022.06)] N85-28029
Physio-chemical mechaniems of the processes of the formation of globular inclusions in ball-bearing metal [BLL-BISI-TRANS-22235-(9022.06)] N85-28030
High-strength weldable steel 03G4N2MAF Sh with improved ductility [BLL-BISI-TRANS-22233-(9022.06)] N85-28031
Thermodynamic analysis of the plasma nitriding of ferrovanadium [BLL-BISI-TRANS-22237-(9022.06)] N85-28032
Forming of coating protection system: Mechanism of paint-coating anti-corrosion protection of steel [BLL-BISI-TRANS-22081-(9022.06)] N85-28033
Corrosion characteristics of some steels produced through a self-cleaning rotating electrode [BLL-BISI-TRANS-22046-(9022.06)] N85-28034
Thermomechanical softening treatment for bearing and tool steels [BLL-BISI-TRANS-22432-(9022.06)] N85-28035
The influence of melting practice and of microalloying, with rare earth metals and with boron, on the quality of low-carbon steel [BLL-BISI-22467-(9022.06)] N85-28036
X-ray crystallography of steel U8 after pulsed laser hardening [BLL-BISI-22444-(9022.06)] N85-28038
Properties of corrosion resistant stabilized ferritic steels [BLL-BISI-TRANS-22519-(9022.06)] N85-28039
Thermomechanical treatment aimed at the protection of type 316 stainless steel from IGC and IGSCC [BLL-BISI-TRANS-22498-(9022.06)] N85-28040
The corrosion resistance of chromium-nickel steel containing rare-earth metals [BLL-BISI-TRANS-22477-(9022.06)] N85-28041
Inoculation of non-metallic inclusions in steel 17GS [BLL-BISI-TRANS-22431-(9022.06)] N85-28042
Preparation of metal for cold upsetting [BLL-BISI-TRANS-22383-(9022.06)] N85-28043
The synergistic actions of stress corrosion cracking and corrosion fatigue [BLL-BISI-TRANS-22334-(9022.06)] N85-28045
Corrosion test on high-alloy steels [BLL-BISI-TRANS-21627-(9022.06)] N85-28046
Improving the properties of copper and copper alloys through heat treatment and alloying [BLL-BISI-TRANS-21939-(9022.06)] N85-28047
Effect of texture in steel on the susceptibility of hydrogen embrittlement [BLL-BISI-TRANS-22026-(9022.06)] N85-28048
Glassy metals: New highly resistant material [BLL-BISI-TRANS-21764-(9022.06)] N85-28049
Powder-metallurgy alloys and steels [BLL-BISI-TRANS-22239-(9022.06)] N85-28050
The state of martensite after quenching in a magnetic field [BLL-BISI-TRANS-22297-(9022.06)] N85-28051
Properties of chromate coatings formed on electrolytic zinc substrates [BLL-BISI-TRANS-22349-(9022.06)] N85-28052

Influence of heat treatment parameters on the properties of induction hardened Ni-Cr-Mo steels
[BLL-BISI-TRANS-2499-(9022.06)] N85-28053
Influence of preliminary cold deformation on fineness of pearlite
[BLL-BISI-TRANS-22409-(9022.06)] N85-28054
Influence of thermochemical treatment on properties of low-carbon steel
[BLL-BISI-TRANS-22410-(9022.06)] N85-28055
New process for production of bimetal with corrosion-resistant cladding layer
[BLL-BISI-TRANS-22371-(9022.06)] N85-28056
Obtaining amorphous coatings of FeW and Fe-Cr-P-B alloys using laser sputtering
[BLL-BISI-22493-(9022.06)] N85-28057
The behaviour of nitride inclusions in nickel-base alloys
[BLL-BISI-TRANS-22396-(9022.06)] N85-28058
Stainless steels: Application and welding
[BLL-BISI-TRANS-22357-(9022.06)] N85-28059
Sintering and properties of metal-ceramic alloys of the Kovar type
[BLL-BISI-TRANS-21822-(9022.06)] N85-28060
Steels with improved machinability
[BLL-BISI-22341-(9022.06)] N85-28061
The structure of carbon martensite analyzed with Mossbauer spectra
[BLL-BISI-TRANS-22402-(9022.06)] N85-28062
Textural transformations taking place during heat and mechanical treatment in triplex steels
[BLL-BISI-TRANS-22404-(9022.06)] N85-28063
Microstructure and mechanical properties of rare-earths-microalloyed high-speed tool steel
[BLL-BISI-TRANS-22043-(9022.06)] N85-28064
Physical properties of steels and their temperature dependence
[BLL-BISI-TRANS-22285-(9022.06)] N85-28065
Study on mechanism of surface deformation induced by stress corrosion cracking
[BLL-BISI-TRANS-21896-(9022.06)] N85-28066
Effects of the phase compositions of cast low-pearlite steels micro-alloyed with vanadium and titanium of their structure and properties
[BLL-BISI-TRANS-22301-(9022.06)] N85-28067
Influence of structural state and alloy content of austenite on formation of martensitic phases in steels
[BLL-BISI-TRANS-22385-(9022.06)] N85-28068
The characteristic structure of weld metal of high temperature alloy X20CrMoV 121
[BLL-BISI-TRANS-21623-(9022.06)] N85-28069
Effect of the agressive action of soil on metallic pipelines. New posaibilities for the passive and active corrosion protection
[BLL-BISI-TRANS-21630-(9022.06)] N85-28070
Influence of manganese and heat treatment on structure and properties of Fe-0.1 percent-C-14 percent Cr-based steels
[BLL-BISI-TRANS-22299-(9022.06)] N85-28071
Part played by non-metallic inclusions during deformation and fracture of steel with different grain sizes
[BLL-BISI-TRANS-22321-(9022.06)] N85-28072
Influence of eutectic silicate inclusions on micro-processes during deformation and fracture of 12GS steel
[BLL-BISI-TRANS-22296-(9022.06)] N85-28073
Examination of steels by chemical analysis for quality assurance
[BLL-BISI-TRANS-22068-(9022.06)] N85-28074
The effect of microalloying with calcium and magnesium on the plasticity of Poldi AKN 20 Ni-based alloy
[BLL-BISI-TRANS-2174-(9022.06)] N85-28075
Obtaining oxide films on surface of tubes of chromium-nickel steels
[BLL-BISI-TRANS-22478-(9022.06)] N85-28076
Use of principle of local equilibrium for assessing diffusional supersaturation during solidification of alloys
[BLL-BISI-TRANS-22487-(9022.06)] N85-28077
Influence of preliminary thermomechanical treatment on depth and hardness of nitrided layers
[BLL-BISI-TRANS-22488-(9022.06)] N85-28078
New method of calculating the economic effects of corrosion
[BLL-BISI-TRANS-22348-(9022.06)] N85-28079
Production and compaction of amorphous metal powders
[BLL-BISI-TRANS-22387-(9022.06)] N85-28080
Dispersion-strengthened powder-metallurgical chromium steels
[BLL-BISI-TRANS-22323-(9022.06)] N85-28081
Metallurgical means of preventing the corrosion of metal
[BLL-BISI-TRANS-22320-(9022.06)] N85-28082
Effects of the cooling rate on the structure of the graphite in inoculated irons
[BLL-BISI-TRANS-22305-(9022.06)] N85-28083
Kinetics of the formation of a complex alloyed boride coating on iron and its properties
[BLL-BISI-TRANS-22303-(9022.06)] N85-28084
Preventing the formation of an anomalous structure in chemically sealed low carbon steel
[BLL-BISI-TRANS-22373-(9022.06)] N85-28085
Removal of longitudinal internal flash from electrically welded tubes
[BLL-BISI-TRANS-22380-(9022.06)] N85-28136
Influence of temperature in melting and casting on quality of medium-alloy steel
[BLL-BISI-TRANS-22310-(9902.06)] N85-28137
Welding of 11 458.1 steel in shielding atmospheres
[BLL-BISI-TRANS-21763-(9022.06)] N85-28353
Local heat treatment of welded joints of pipes and rotary vessels
[BLL-BISI-TRANS-22197-(9022.06)] N85-28354
Determination of wear intensity and resource of crankshafts and cylinder liners of ZIL-130 and ZMZ-53 engines
[BLL-BISI-TRANS-21393-(9022.06)] N85-28355
Submerged arc welding of new Czechoslovak micro-alloy steels
[BLL-BISI-TRANS-22193-(9022.06)] N85-28356
Study of a simulated test for assessing the machinability of steels
[BLL-BISI-TRANS-22344-(9022.06)] N85-28357
Application of 4-wire submerged arc method to welding UOE pipe
[BLL-BISI-TRANS-22417-(9022.06)] N85-28358
Study of a test method for assessing machinability in gear cutting operations
[BLL-BISI-TRANS-22345-(9022.06)] N85-28359
New method for determining stampability of sheet materials
[BLL-BISI-22486-(9022.06)] N85-28360
Technical information: Weldability of stainless steel. Part 1: Austenitic stainless steel
[BLL-BISI-TRANS-22456-(9022.06)] N85-28362
Examples of application of machinability tests
[BLL-BISI-TRANS-22346-(9022.06)] N85-28363
Production of thin-walled electricity welded tubes with reduced internal flash
[BLL-BISI-TRANS-22381-(9022.06)] N85-28364
Assessing the machinability of gearwheel steels during manufacture
[BLL-BISI-TRANS-22343-(9902.06)] N85-28365
High-speed longitudinal welding of pipes by automatic submerged arc process
[BLL-BISI-TRANS-22340-(9902.06)] N85-28366
Production of electrically welded tubes with removed internal flash
[BLL-BISI-TRANS-22382-(9022.06)] N85-28367
Formation of a fine structure during shock wave welding
[BLL-BISI-TRANS-22401-(9022.06)] N85-28368
Steel Tubes
[BLL-BISI-TRANS-22064-(9022.06)] N85-28369
Examination of the regions of the joint of sheets bonded by the explosive welding technique
[BLL-BISI-TRANS-22352-(9022.06)] N85-28370
Magnetic flux leakage inspection: Principles and applications
[BLL-BISI-TRANS-22248-(9022.06)] N85-28382
Proper quality of anticorrosion work no matter how bad the atmospheric conditions
[BLL-BISI-TRANS-22080-(9022.06)] N85-28383
Statistical models used in analyzing the quality of welded tubes
[BLL-BISI-TRANS-22232-(9022.06)] N85-28384
Quality testing to the specifications of the Stahl-Eisen-Pruefblatt 1570/71 using an automatic image analysis system
[BLL-BISI-TRANS-22253-(9022.06)] N85-28385
Differential between crack and pseudo-crack indications by means of objective magnetic flux leakage testing
[BLL-BISI-TRANS-22033-(9022.06)] N85-28386
Inspection of welds and the factors improving its effectiveness in welded structure fabrication
[BLL-BISI-TRANS-22194-(9022.06)] N85-28387
Non-destructive testing of HF-welded pipe
[BLL-BISI-TRANS-22182-(9022.06)] N85-28388
Principal quality assurance measures in the manufacture of HF-welded high-pressure linepipe
[BLL-BISI-TRANS-21690-(9022.06)] N85-28389
State of stress and penetration of plastic deformation in forming
[BLL-BISI-22199-(9022.06)] N85-28396
Measurement of fracture macro-geometry in evaluating fracture toughness
[BLL-BISI-TRANS-22241-(9022.06)] N85-28403
Tests of low-cycle fatigue of elected steels of class 11
[BLL-BISI-TRANS-22039-(9022.06)] N85-28404
Fracture mechanics analysis of cold drawn Si-Cr valve steel
[BLL-BISI-TRANS-22216-(9022.06)] N85-28405
Relaxation properties and fatigue fracture resistance of austenitic spring steel
[BLL-BISI-TRANS-22300-(9022.06)] N85-28406
Limiting values of stress state index after rupture of metals
[BLL-BISI-TRANS-22293-(9022.06)] N85-28407
On validity of threshold values of fatigue strength of steel structures
[BLL-BISI-TRANS-22192-(9022.06)] N85-28408
The Mises yield condition for thin rotationally symmetric shells
[BLL-BISI-TRANS-22047-(9022.06)] N85-28409
The fatigue properties of welds at low temperature, according to the type of steel
[BLL-BISI-TRANS-22455-(9022.06)] N85-28410
Fatigue crack propagation characteristics and fatigue fracture toughness in 780 MPa grade high strength steel weldments at low temperature
[BLL-BISI-TRANS-22389-(9022.06)] N85-28411
Effects of the structural state in thermo-bimetals on their resistance to microscopic plastic deformation
[BLL-BISI-TRANS-22403-(9022.06)] N85-28412
World iron ore reserves
[BLL-BISI-TRANS-22280-(9022.06)] N85-28435
Method of assessment of start of slow crack growth by acoustic emission technique
[BLL-BISI-TRANS-21762-(9022.06)] N85-28722
Detecting and analyzing crack defects
[BLL-BISI-TRANS-22062-(9022.06)] N85-28723
Echo-response from crack-like two-dimensional reflectors in focused ultrasonic fields N85-28724
Ultrasonic crack tip method for the determination of crack depth N85-28725
Thermodynamic calculations of equilibrium states in metal-carbon-hydrogen-oxygen system
[BLL-BISI-TRANS-22092-(9022.06)] N85-28844

MICHIGAN STATE UNIV., EAST LANSING.
Airphoto interpretation of vegetation and landforms for soil mapping N85-28436
Laboratory research: A question of when, not if
[AD-A153298] N85-28867

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[AD-A152360] N85-28227
Photosynthetic acclimation of Acer saccharum
[DE85-008247] N85-28536
Optimal design and use of retry in fault tolerant real-time computer systems
[NASA-CR-175920] N85-28643

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[DE85-000542] N85-28019
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[DE85-002927] N85-28451
Morphology of GaAs/sub 1-x/P/sub x/ superlattices grown by MOCVD and chloride VPE
[DE85-002944] N85-28842

MINNESOTA UNIV., MINNEAPOLIS.
The impact of group processing on achievement in cooperative learning groups
[AD-A153168] N85-28551
Oral discussion, group-to-individual transfer and achievement in cooperative learning groups
[AD-A153209] N85-28552
The effects of controversy and concurrence seeking on effective decision making
[AD-A153370] N85-28555
Central problems in the management of innovation
[AD-A152598] N85-28852
An examination of alternative forms of fit in contingency theory
[AD-A152602] N85-28853
The concept of fit in contingency theory
[AD-A152603] N85-28854

MISSISSIPPI STATE UNIV., MISSISSIPPI STATE.
Parameterization in grid generation N85-28581
Generation of surface coordinates by elliptic partial differential equations N85-28583
A survey of composite grid generation for general three-dimensional sections N85-28584
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[NAE-AN-28] N85-27829
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[NAE-AN-27] N85-27830

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Test devices for aeronautical research and technology
[NASA-TM-77651] N85-27914
Descent vehicles
[NASA-TM-77654] N85-27933
The production of copper phthalocyanine and/or its derivatives
[NASA-TM-77629] N85-27983
Pressed boride cathodes
[NASA-TM-77821] N85-27984
The loss of material from the cathode of metal arcs
[NASA-TM-77845] N85-27985
Heat transfer in pipes
[NASA-TM-77838] N85-28262
Adding computationally efficient realism to Monte Carlo turbulence simulation
[NASA-TP-2469] N85-28708
Optimum dimensions of power solenoids for magnetic suspension
[NASA-TM-77864] N85-28716
Study of a constricted electric arc cooled by transpiration
[NASA-TM-77846] N85-28798

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[NASA-TP-2485] N85-27823
Numerical study of porous airfoils in transonic flow
[NASA-TM-86713] N85-27828
Rotorcraft research testing in the National Full-Scale Aerodynamics Complex at NASA Ames Research Center
[NASA-TM-86687] N85-27854
Active control technology experience with the Space Shuttle in the landing regime N85-27900
Kolmogorov and scalar spectral regimes in numerical turbulence
[NASA-TM-86699] N85-28264
The cosmic history of the biogenic elements and compounds
[NASA-SP-476] N85-28562
Contouring trivariate data N85-28582

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION. GODDARD SPACE FLIGHT CENTER, GREENBELT, MD.
CPS navigation experiment using high precision GPS timing receivers N85-28299
International time transfer and portable clock evaluation using GPS timing receivers: Preliminary results N85-28303
Precise time transfer using MKIII VLBI technology N85-28310
Recent results on the peformance of EFOS, NP and NX hydrogen masers N85-28320
Potential climatic impacts of increasing atmospheric CO2 with emphasis on water availability and hydrology in the United States
[NASA-TM-87479] N85-28517
Special topics in infrared interferometry
[NASA-TM-87472] N85-28794
Experimental philosophy leading to a small scale digital data base of the conterminous United States for designing experiments with remotely sensed data
[NASA-TM-85009] N85-28877

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION. LANGLEY RESEARCH CENTER, HAMPTON, VA.
Supersonic aerodynamic characteristics of canard, tailless, and aft-tail configurations for 2 wing planforms
[NASA-TP-2434] N85-27822
Friction and wear behavior of aluminum and composite I-beam stiffened airplane skins
[NASA-TM-86418] N85-27852
Addition of flexible body option to the TOLA computer program, part 1
[NASA-CR-132732-1] N85-27855
Addition of flexible body option to the TOLA computer program. Part 2: User and programmer documentation
[NASA-CR-132732-2] N85-27856
Active control landing gear for ground load alleviation N85-27902
Effect of superconducting solenoid model cores on spanwise iron magnet roll control
[NASA-TM-86378] N85-27915
Background noise measurements from jet exit vanes designed to reduced flow pulsations in an open-jet wind tunnel
[NASA-TM-86383] N85-27916
Deployable controllable geometry truss beam
[NASA-TM-86366] N85-27934
An investigation of molecular structure of copolymers using positron annihilation spectroscopy
[NASA-TM-86431] N85-27977
Computational Geometry and Computer-Aided Design
[NASA-CP-2379] N85-28563
Peer Review of a Formal Verification/Design Proof Methodology
[NASA-CP-2377] N85-28609
Synchronization and fault-masking in redundant real-time systems
[NASA-TM-87478] N85-28644

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Ice shapes and the resulting drag increase for a NACA 0012 airfoil
[NASA-TM-83556] N85-27839
Future fundamental combustion research for aeropropulsion systems
[NASA-TM-87049] N85-27870
Structural Integrity and Durability of Reusable Space Propulsion Systems
[NASA-CP-2381] N85-27941
Overview of aerothermodynamic loads definition study N85-27942
SSME fuel preburner two-dimensional analysis N85-27943
Simulation of multistage turbine flows N85-27945
Unsteady heat transfer due to time-dependent free stream velocity N85-27947
New facility to study unsteady wake effects on turbine airfoil heat transfer N85-27948
Overview of structural response: Probabilistic structural analysis N85-27952
Interaction of high-cycle and low-cycle fatigue of Haynes 188 alloy at 1400 F deg N85-27961
Reexamination of cumulative fatigue damage laws N85-27962
Cyclic structural analyses of SSME turbine blades N85-27963
Thin-film sensors for space propulsion technology N85-27968
Heat flux sensor calibrator N85-27970
Primary propulsion of electrothermal, ion and chemical systems for space-based radar orbit transfer
[NASA-TM-87043] N85-27972
Designing for fiber composite structural durability in hygrothermomechanical environment
[NASA-TM-87045] N85-27978
Preparation of silicon carbide-silicon nitride fibers by the pyrolysis of polycarbosilazane precursors
[NASA-TM-86505] N85-28107
A micrographic and gravimetric study of intercalation and deintercalation of graphite fibers
[NASA-TM-87026] N85-28110
Performance analysis of radiation cooled dc transmission lines for high power space systems
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Operating characteristics of a 0.87 kW-hr
[NASA-TM-87038] N85-28371
Lubricant and additive effects on spur gear fatigue life
[NASA-TM-87044] N85-28373
Initial performance of advanced designs for IPV nickel-hydrogen cells
[NASA-TM-87029] N85-28444
Real-Time Multiprocessor Programming Language (RTMPL) user's manual
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Incident beam polarization for laser Doppler velocimetry employing a sapphire cylindrical window
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[NASA-TP-2489] N85-28656

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Aerodynamic research in preparation for a new Dutch transport aircraft with supercritical wings
[B8580077] N85-27836
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[NLR-MP-84021-U] N85-27847
Developments in the area of air traffic control systems and the relation with meteorology
[NLR-MP-84029-U] N85-27848
A system for take-off and landing measurements (STALINS)
[B8580072] N85-27849
Parameter identification results of tests in nonsteady symmetric flight with the Hawker Hunter Mk 7
[NLR-TR-83042-U] N85-27860
New materials and techniques for aircraft structures
[B8580074] N85-27861
Fan noise suppression in turbofan engines
[B8580076] N85-27872
Testing of materials and coatings for jet engine components under simulated operational conditions
[B8580073] N85-27873
How to handle failures in advanced flight control systems of future transport aircraft N85-27905
IRAS: Space technology from the Netherlands
[B85101841] N85-27929
Hydrogen embrittlement of high-strength steel
[B8580075] N85-28103
The application of numerical control (NC) in manufacturing wind tunnel models
[B8580078] N85-28140
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[NLR-MP-84001-U] N85-28430
Frangibility of obstacles at airports
[NLR-MP-84002-U] N85-28431
Research on structures and materials
[B8580080] N85-28432
Earth observation modeling based on layer scattering matrices
[NLR-MP-84015-U] N85-28440
Developments in remote sensing
[B8580069] N85-28441
Operations research
[B8561897] N85-28712
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[NLR-MP-84011-U] N85-28796
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[B8561898] N85-28871
The IRAS end-to-end data system
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The development of information systems at NLR
[B8580079] N85-28884

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New time and frequency services at the National Bureau of Standards N85-28289
Recent improvements in the atomic time scales of the National Bureau of Standards N85-28290
Separating the variances of noise components in the Global Positioning System
[AD-P004578] N85-28295

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[FAA/PM-85-11] N85-28516
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[AD-A152321] N85-28544
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[AD-A152337] N85-28545
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[AD-A152361] N85-28547
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[AD-A152317] N85-28543
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Automation of Precise Time Reference Stations (PTRS) N85-28291
US Naval Observatory collection and utilization of time comparison data N85-28292
Improved master clock reference system at USNO N85-28300
Timing-system design considerations for a mobile astrolabe N85-28309
NAVAL POSTGRADUATE SCHOOL, MONTEREY, CALIF.
A method to calculate the parameters of wings of arbitrary planform
[AD-A152689] N85-27831
Real-time position determinations using the GPS TI4100/GEOSTAR receiver
[AD-A152551] N85-27845
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[AD-A152627] N85-27876
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[AD-A152628] N85-28205
The weighting function for scintillation on a folded path
[AD-A152659] N85-28206
Measured noise performance of a new method of frequency hopping
[AD-A152679] N85-28234
Experimental performance of a frequency measurement circuit
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[AD-A152657] N85-28340
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First passage times for combinations of random loads
[AD-A153275] N85-28423
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Investigation and implementation of a tree transformation system for user friendly programming
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Unattended TV time transfer results N85-28305
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[AD-A152701] N85-28801
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[AD-A152480] N85-28325
Navy geothermal plan
[AD-A152478] N85-28450
Quality assurance for RESOLVE (Research on Operations-Limiting Visual Extinction). A visibility study in the California desert
[AD-A152383] N85-28494
NAVY PERSONNEL RESEARCH AND DEVELOPMENT CENTER, SAN DIEGO, CALIF.
An empirical comparison of the accuracy of univariate and multivariate corrections for range restriction
[AD-A153071] N85-28670
NEW ORLEANS UNIV., LA.
A study of gas solid reactions using coated piezoelectric detectors
[AD-A153047] N85-28001
Spline curves, wire frames and B-value N85-28587
NICHOLS RESEARCH CORP., ANN ARBOR, MICH.
Analysis and modeling for thermal focal plane arrays
[AD-A153156] N85-28329
NORTH CAROLINA CENTRAL UNIV., DURHAM.
High precision materials characterization in the near millimeter wave-length range
[AD-A153267] N85-28331
NORTH CAROLINA STATE UNIV., RALEIGH.
A natural bias approach to cardinal spline curves N85-28575
NORTH CAROLINA UNIV., CHAPEL HILL.
Electrochemistry of polymer films not immersed in solution: Electron transfer on an ion budget
[AD-A152989] N85-27998
On the exceedance point process for a stationary sequence
[AD-A152827] N85-28665
A bilaterally deterministic rho-mixing stationary random sequence
[AD-A152856] N85-28666
Nonsmooth analysis and Frechet differentiability of M-functionals
[AD-A152932] N85-28668
Extension of three theorems of Fourier series on the disc to the torus
[AD-A153017] N85-28669
Estimating random integrals from noisy observations: Sampling designs and their performance
[AD-A152926] N85-28702
On stochastic integral representation of stable processes with sample paths in Banach spaces
[AD-A152927] N85-28703
A trivariate version of Levy's equivalence
[AD-A153157] N85-28705
Maximum flow in planar networks with exponentially distributed arc capacities
[AD-A153158] N85-28710
Technology and technical efficiency in the Soviet Union: Dominant patterns of constrained optimization in a noncompetitive economic regime
[AD-P004567] N85-28862
NORTHWESTERN UNIV., EVANSTON, ILL.
Probabilistic finite element: Variational theory N85-27957
The development of laser analytical methods for the characterization of solid-liquid and solid-high pressure gas interfaces
[AD-A152382] N85-27988
Combustion and micro-explosion of water/oil emulsions in high pressure environments
[AD-A152960] N85-27997
The spectroscopy and reaction kinetics of coordinated unsaturated metal carbonyls
[AD-A153079] N85-28003
X-ray diffraction study of changes in stress-strain distributions during fatigue of a 2-phase alloy
[AD-A152367] N85-28087
An X-ray diffraction study of the residual stress-strain distribution in shot-peened 2-phase brass
[AD-A152418] N85-28088
Interaction among inhomogeneities and inclusions
[AD-A153114] N85-28419
NOTRE DAME UNIV., IND.
Photochemistry of coordination complexes: The phthalocyanines
[DE85-007693] N85-28022

O

OAK RIDGE GASEOUS DIFFUSION PLANT, TENN.
FLOWPLOT 2: A fluid dynamics and heat transfer plotting package
[DE85-009802] N85-28277
OAK RIDGE NATIONAL LAB., TENN.
The disordering process in an L12 ordered alloy
[DE85-008152] N85-28093
Characterization of the fatigue and slow crack growth behavior of partially stabilized zirconia ceramics
[DE85-005240] N85-28113
Indirect brazing of structural ceramics for uncooled diesels
[DE85-005569] N85-28116
Scanning electron microscope facility for examination of radioactive materials
[DE85-008127] N85-28335
Laser measurements of distances from the ORELA neutron target to experiment stations along flight paths 1 and 6
[DE85-009457] N85-28352
Simplified analysis of Stirling engines and heat pumps
[DE85-008753] N85-28457
Time-dependence of CO2-induced climate change
[DE85-007568] N85-28525
Chemicals identified in human biological media, a data base, volume 6, part 1
[DE85-008768] N85-28542
Symbolic Givens reduction in large sparse least squares problems
[DE85-008685] N85-28681
Parallel Cholesky factorization on a multiprocessor
[DE85-008762] N85-28682
Torus data flow for parallel computation of missized matrix problems
[DE85-008761] N85-28715
Experience with oepration of a large magnet system in the international fusion superconducting magnet test facility
[DE85-009288] N85-28721
Experimental approaches to the measurement of dielectronic recombination
[DE85-00627] N85-28743
Nonrelativistic theory of heavy-ion collisions
[DE85-007538] N85-28747
Multiple scattering effects in low energy alkali ion scattering: Application to the analysis of adsorbate ordering and bonding geometry
[DE85-007575] N85-28757
Accelerator-based plasma-wall interaction studies on the TEXTOR Tokamak
[DE85-007540] N85-28806
Impurity control and vacuum pumping system design and analysis for next-generation Tokamaks
[DE85-009291] N85-28815
Theoretical and numerical studies of magnetic field line displacements in an Elmo Bumpy Torus
[DE85-008757] N85-28816
Handbook on superconductivity: The large-scale applications. Chapter 4
[DE85-008170] N85-28838

OAK RIDGE Y-12 PLANT, TENN.
Efforts at office automation and information systems utilization at Martin Marietta Energy Systems, Incorporated
[DE85-008154] N85-28633
OFFICE NATIONAL D'ETUDES ET DE RECHERCHES AEROSPATIALES, PARIS (FRANCE).
Wing buffeting active control testing on a transport aircraft configuration in a large sonic windtunnel
N85-27903
OFFICE OF NAVAL RESEARCH, LONDON (ENGLAND).
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[AD-A152455] N85-28718
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[AD-A152467] N85-28850
OGDEN AIR LOGISTICS CENTER, HILL AFB, UTAH.
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[AD-A153206] N85-27973
MM2 LRSLA testing stage 3 propellant
[AD-A152540] N85-28128
OHIO STATE UNIV., COLUMBUS.
A study of internal and distributed damping for vibrating turbomachiner blades
[NASA-CR-175901] N85-27868
Research on the kinetics of phase changes in solids
[AD-A152387] N85-27989
OKLAHOMA STATE UNIV., STILLWATER.
Predictions and measurements of isothermal flowfields in axisymmetric combustor geometries
[NASA-CR-174916] N85-27867
OLD DOMINION UNIV., NORFOLK, VA.
Central limit theorems in the area of large deviations for some dependent random variables
[AD-A153125] N85-28831
OREGON STATE UNIV., CORVALLIS.
Mathematical modeling and simulation of climate and climatic change
[DE85-008974] N85-28526

P

PACIFIC NORTHWEST LAB., RICHLAND, WASH.
Systematic nomenclature of the nitrogen, oxygen and sulfur functional polycyclic aromatic hydrocarbons
[DE85-007426] N85-27974
Raman studies of laser damaged single and multi-layer optical coatings
[DE85-009431] N85-28351
Tribological sinks: Money down the drain
[DE85-010019] N85-28376
Looking at more than three dimensions
[DE85-007764] N85-28600
PENNSYLVANIA STATE UNIV., UNIVERSITY PARK.
Vibrational spectra of a-Fe(.78)P(.22) by inelastic neutron scattering
[DE85-008298] N85-28016
The synthesis and structure of polyphosphazenes
[AD-A153134] N85-28112
Experimental and theoretical studies on transport processes in laser welding
[DE84-008572] N85-28378
Confidence intervals based on interpolated order statistics
[AD-A152607] N85-28701
PHYSICAL SCIENCES, INC., ANDOVER, MASS.
Experimental and theoretical study of condensation in multicomponent vapors
[DE85-009357] N85-28021
Molten carbonate fuel cell performance model update
[DE85-003356] N85-28454
PITTSBURGH UNIV., PA.
An inequality and its application to the truncated distributions N85-28673
Robust tests of mean vector in symmetrical multivariate distributions
[AD-A153116] N85-28674
PLESSEY MARINE RESEARCH UNIT, TEMPLECOMBE (ENGLAND).
Sound intensity measurement N85-28398
POLISH ACADEMY OF SCIENCES, WARSAW.
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[IFPR-13/1984] N85-28104
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[NASA-CR-175886] N85-28106
POLYTECHNIC INST. OF NEW YORK, FARMINGDALE.
Investigation of the structure and dynamics of electrolytes in solvents used for primary and secondary Li-batteries
[AD-A153099] N85-28240
PRINCETON UNIV., N. J.
The role of surface generated radicals in catalytic combustion N85-27869
PRINS MAURITS LAB. TNO, RIJSWIJK (NETHERLANDS).
Polynomial approaches for the characteristic velocity and flame temperature as a function of mixing compounding and pressure for the systems PMMA/O2, PMMA/air, PE/O2, PE/air, PS/O2 and PS/air
[VTH-LR-421] N85-28024
PUBLIC SERVICE ELECTRIC AND GAS CO., NEWARK, N. J.
Baseline cycle testing of a 500-kWh zinc chloride battery at the Battery Energy Storage Test (BEST) Facility
[DE85-006948] N85-28249
PURDUE UNIV., LAFAYETTE, IND.
Report on high intensity solar cells
[DE85-008396] N85-28462
Adapting shape parameters for cubic Bezier curves
N85-28576
Hall mobility in fluid argon
[DE85-007288] N85-28840

Q

QUEENSLAND UNIV., ST. LUCIA (AUSTRALIA).
Buckling and bracing of cantilevers
[CE-42] N85-28413

R

RAITH (HERMANN) K.G., DORTMUND (WEST GERMANY).
Development of a multiprocessor system, using the MOTORLA microprocessor 6809, with the aim of providing maximum flexibility in the design of individual control devices
[BMFT-FB-T-84-270] N85-28607
RAND CORP., SANTA MONICA, CALIF.
Individual characteristics and unit performance: A review of research and methods
[AD-A153145] N85-28550
A formal analysis of the evolution of cooperation
[AD-A152539] N85-28662
Soviet weapons development and the scientific community
[AD-P004562] N85-28857
The outlook for Soviet advanced technologies
[AD-P004564] N85-28859
RENSSELAER POLYTECHNIC INST., TROY, N. Y.
Completely consumed carbide: A new process for dielectric isolation
[AD-A152379] N85-27987
The electrochemistry of azine, oxazine and thiazine dyes
[AD-A152394] N85-27990
Thin films properties of sputtered niobium silicide on SiO2, Si3N4 and on n+ poly-Si
[AD-A152378] N85-28228
When is a Bernstein-Bezier curve the graph of a function? N85-28568
RESEARCH TRIANGLE INST., DURHAM, N. C.
Comprehensive silicon solar cell computer modeling
[NASA-CR-175959] N85-28461
RESEARCH TRIANGLE INST., RESEARCH TRIANGLE PARK, N.C.
Peer Review of a Formal Verification/Design Proof Methodology
[NASA-CP-2377] N85-28609
RESOURCE PLANNING ASSOCIATES, INC., ITHACA, N.Y.
Study of raster metafile formats
[AD-A153322] N85-28624
ROCHESTER UNIV., N. Y.
Theory of laser-stimulated surface process. 2: A generalized-master-equation approach to energy transfer between an IR laser, an aspecties and phonons
[AD-A153083] N85-28344
Optical phenomena in computer vision
[AD-A152970] N85-28595
Lattice actions improved by block-spin renormalisation group and maximally symmetric lattices
[DE85-007416] N85-28841
ROCKEFELLER UNIV., NEW YORK.
Experimental studies of diffractive phenomena
[DE85-006812] N85-28749
ROCKWELL INTERNATIONAL CORP., CANOGA PARK, CALIF.
Composite loads spectra for select space propulsion structural components N85-27953
Feasibility of mapping velocity flow fields in SSME powerhead by laser anemometry techniques
N85-27971
ROCKWELL INTERNATIONAL CORP., DOWNEY, CALIF.
Space Station crew safety alternatives study. Volume 5: Space Station safety plan
[NASA-CR-3858] N85-27930
ROCKWELL INTERNATIONAL CORP., GOLDEN, COLO.
Process for clarification of water
[DE85-007864] N85-28023
ROCKWELL INTERNATIONAL SCIENCE CENTER, THOUSAND OAKS, CALIF.
Properties of defects in Hg(1-x)Cd(x)Te
[AD-A153243] N85-28835
ROME AIR DEVELOPMENT CENTER, GRIFFISS AFB, N.Y.
The touch panel system: Design and development
[AD-A153014] N85-28596
Random access memory technologies
[AD-A153089] N85-28597
Rome Development Center Air Force technical objective document C3I FY-86
[AD-A152476] N85-28851
ROSENTHAL-STEMAG, TECHNISCHE KERAMIK A.G., SELB (WEST GERMANY).
Development of high temperature resistant, noncorrosible, non-metallic ceramic materials, especially silicon nitride in gas turbine application
[BMFT-FB-T-85-015] N85-28125
Development of high temperature resistant noncorrodible silicon carbide components for gas turbine applications, follow-up report
[BMFT-FB-T-85-016] N85-28126
ROTTERDAM AVIATION ASSOCIATION (NETHERLANDS).
Rotterdam Airport and the Common Market
N85-27840
ROYAL AIRCRAFT ESTABLISHMENT, BEDFORD (ENGLAND).
The evolution of ACS for helicopters: Conceptual simulation studies to preliminary design N85-27890
ROYAL AIRCRAFT ESTABLISHMENT, FARNBOROUGH (ENGLAND).
A ten channel temperature controller
[AD-A152664] N85-28326
Analytical generation of satellite orbits at the RAE (Royal Aircraft Establishment)
[AD-A152655] N85-28901
ROYAL NETHERLANDS METEOROLOGICAL INST., DE BILT.
Observations of surface water temperature in the Netherlands since 1860: Statistics
[KNMI-WR-84-3] N85-28531
Observations of surface water temperature in the Netherlands since 1860: Tables for light vessels
[KNMI-WR-84-4] N85-28532
Observations of surface water temperature in the Netherlands since 1860: Series from KNMI-RWS
[KNMI-WR-84-5] N85-28533
ROYAL SIGNALS AND RADAR ESTABLISHMENT, MALVERN (ENGLAND).
Moon bounce communications to small terminals
[AD-A153297] N85-28212
Automatic distribution of programs in MASCOT and Ada (trademark) environments: A feasibility study
[AD-A152665] N85-28614
RUHR UNIV., BOCHUM (WEST GERMANY).
Ionospheric effects on antenna impedance
[BMFT-FB-W-84-052] N85-28217

S

SANDIA LABS., ALBUQUERQUE, N. MEX.
Model for the growth of fractal silica polymers
[DE85-007884] N85-28115
Ac field-induced order in dense colloidal systems
[DE85-009107] N85-28119
Effects of processing chemistry on electrical properties of high field ZnO varistors
[DE85-007688] N85-28254
Technique for measuring the effective source reflection coefficient of 2-resistor power splitters
[DE85-009964] N85-28256
Laser measurement techniques: Laser spectroscopy in semiconductors
[DE85-007887] N85-28350
Laser welder for fabricating neutron tubes
[DE85-009965] N85-28377

Field test report of the Department of Energy's 100-kW vertical axis wind turbine
[DE85-008475] N85-28458
Shenandoah parabolic dish solar collector
[DE85-008326] N85-28460
Report on high intensity solar cells
[DE85-008396] N85-28462
Boundary to constructive solid geometry mapings: A focus on 2-D issues N85-28570
TRINITY: A pre- and post-processing program for 2-dimensional finite element data
[DE85-008029] N85-28626
Numerical benchmark study for the finite element computer code NEPTUNE
[DE85-008400] N85-28630
Measurement and interpretation of electron angle at MABE beam stop
[DE85-008583] N85-28755
Recent advances in optical measurement methods in physics and chemistry
[DE85-008895] N85-28792
DOE/Sandia point-focus concentrator program, draft
[DE85-008209] N85-28793

SCIENCE APPLICATIONS, INC., MCLEAN, VA.
Geophysical plasmas and atmospheric modeling
[AD-A152805] N85-28497

SCIENTIFIC RESEARCH ASSOCIATES, INC., GLASTONBURY, CONN.
Users manual for coordinate generation code CRDSRA
[NASA-CR-172584] N85-27824
User's manual for airfoil flow field computer code SRAIR
[NASA-CR-172585] N85-27825

SCRIPPS INSTITUTION OF OCEANOGRAPHY, LA JOLLA, CALIF.
The rifted margin of Saudi Arabia N85-28483

SHAANXI ASTRONOMICAL OBSERVATORY, LINTONG (CHINA).
Timing accuracy of LF and TV synchronization techniques N85-28288

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[AD-A151051] N85-28397
The Shock and Vibration Digest, volume 17, no. 2
[AD-A153129] N85-28400

SIEMENS A.G., MUNICH (WEST GERMANY).
High temperature position sensors based on monolithic GaAs Hall IC
[BMFT-FB-T-84-266] N85-28337
Further development of high voltage SIPMOS FET's to fulfill market needs
[BMFT-FB-T-84-255] N85-28843

SIGRI ELECTROGRADHIT G.M.B.H., MEITINGEN (WEST GERMANY).
Reaction-bonded and fiber-reinforced SiC static and dynamic gas turbine components
[BMFT-FB-T-84-302] N85-27874

SIMPSON WEATHER ASSOCIATES, CHARLOTTESVILLE, VA.
Convective storm downdraft outflows detected by NASA/MSFC's Airborne 10.6 micron pulsed Doppler Lidar System
[NASA-CR-3898] N85-28511

SMITHS INDUSTRIES LTD., BISHOPS CLEEVE (ENGLAND).
ACT applied to helicopter flight control N85-27891

SMITHSONIAN ASTROPHYSICAL OBSERVATORY, CAMBRIDGE, MASS.
The study of the physics of cometary nuclei
[NASA-CR-175917] N85-28905

SOCIETE NATIONALE INDUSTRIELLE AEROSPATIALE, TOULOUSE (FRANCE).
Certifying complex digital systems on civil aviation aircraft N85-27907

SOFTWARE ARCHITECTURE AND ENGINEERING, INC., ARLINGTON, VA.
Application of artificial intelligence (AI) to radar image understanding
[AD-A152519] N85-28654

SOUTHEASTERN CENTER FOR ELECTRICAL ENGINEERING EDUCATION, INC., ST. CLOUD, FLA.
Basic EMC technology advancement for C3 systems. Volume 4F: Prediction of crosstalk in flatpack coaxial cables
[AD-A153111] N85-28242

SOUTHERN METHODIST UNIV., DALLAS, TEX.
Injection laser structure design
[AD-A153210] N85-28345

SOUTHWEST RESEARCH INST., SAN ANTONIO, TEX.
Probabilistic structural analysis theory development N85-27955
Evaluation of pyrotechnic fire suppression system for six pyrotechnic compositions
[AD-A152995] N85-28130
Clean-burning diesel engines
[AD-A152606] N85-28374

SRI INTERNATIONAL CORP., MENLO PARK, CALIF.
Homogeneous processes of atmospheric interest
[NASA-CR-175770] N85-28475

STANFORD LINEAR ACCELERATOR CENTER, CALIF.
Computing environments for data analysis. Part 1: Introduction
[DE85-007919] N85-28603
Computing environments for data analysis. Part 2: Hardware
[DE85-008320] N85-28604
Introduction to LINE: A Feynman diagram graphic operator
[DE85-009299] N85-28632
There is no I/O like no I/O
[DE85-009115] N85-28634
Magnetic monopoles
[DE85-008176] N85-28719
Implications for supersymmetry of the CERN monojets
[DE85-008178] N85-28741
Photon-photon collisions
[DE85-008056] N85-28742
Wake fields and wake field acceleration
[DE85-008054] N85-28750
Possible indication of an A-dependence of R in deep-inelastic electron scattering from nuclei
[DE85-008174] N85-28763
Particle physics: Recent successes and future prospects
[DE85-008175] N85-28765
Heavy quark production processes in QCD
[DE85-007240] N85-28779
Physics of (very) high energy e(+)-e(-) colliders
[DE85-008177] N85-28780
Experimental methods of heavy quark detection
[DE85-006316] N85-28781

STANFORD TELECOMMUNICATIONS, INC., SANTA CLARA, CALIF.
Enhacements to the TTS-502 time transfer system N85-28296

STANFORD UNIV., CALIF.
Free-surface phenomena under low- and zero-gravity conditions
[NASA-CR-175885] N85-27922
Expressiveness and language choice
[AD-A153280] N85-28623
A collection of probability distributions
[AD-A153128] N85-28704
Science and Technology in the Soviet Union
[AD-A152828] N85-28856
The revolution in military affairs and the Soviet system
[AD-P004568] N85-28863

STATE SEISMOLOGICAL BUREAU OF CHINA, BEIJING.
A preliminary analysis of the Saudi Arabian deep seismic sounding data N85-28489

STATE UNIV. COLL. OF NEW YORK, BUFFALO.
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[AD-A152632] N85-28731
Effects of level broadening on the magnetothermal oscillations in two-dimensional electron systems
[AD-A152639] N85-28732

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Comparison of two algebraic methods for curve/curve intersection N85-28591

STUTTGART UNIV. (WEST GERMANY).
SC filters and design centering of integrated circuits. Part 2: Design centering of integrated circuits
[BMFT-FB-T-84-265-PT-2] N85-28257
Spread spectrum time transfer experiment via INTELSAT N85-28304

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Natural and accelerated aging of plastics N85-28123
Qualitative and quantitative determination of aging by mechanical tests N85-28393

SVERDRUP TECHNOLOGY, INC., MIDDLEBURG HEIGHTS, OHIO.
SSME turbopump turbine computations N85-27944
Probabilistic structural analysis of SSME turbopump blades: Probabilistic geometry effects N85-27958
Structural tailoring of SSME blades (vanes) N85-27960
Optical strain measurement system development N85-27969

SYRACUSE UNIV., N. Y.
Electromagnetic transmission through a slot in a perfectly conducting plane
[AD-A153224] N85-28210

SYSTEMS PLANNING CORP., ARLINGTON, VA.
Evidential reasoning in expert systems for image analysis
[AD-A153379] N85-28627

SYSTEMS TECHNOLOGY, INC., HAWTHORNE, CALIF.
A perspective on superaugmented flight control advantages and problems N85-27886

T

TECHNISCHE HOGESCHOOL, DELFT (NETHERLANDS).
Upwind-difference methods for aerodynamic problems governed by the Euler equations
[REPT-84-23] N85-27834
Transonic Mach number determination in a blow-down wind tunnel with solid walls and a downstream throat
[VTH-LR-402] N85-27835
Polynomial approaches for the characteristic velocity and flame temperature as a function of mixing compounding and pressure for the systems PMMA/O2, PMMA/air, PE/O2, PE/air, PS/O2 and PS/air
[VTH-LR-421] N85-28024
Aluminum-lithium alloys: The answer of the aluminum industry to the threat of advanced fiber-reinforced materials
[VTH-LR-406] N85-28102
Steady, incompressible, inviscid flow through a finite collapsible tube under longitudinal tension
[REPT-84-01] N85-28278
A counterpart of Faxen's formula in potential flow
[REPT-84-09] N85-28279
A second-order pressure-correction method for viscous incompressible flow
[REPT-84-15] N85-28280
Flow through finite collapsible tubes: A branching problem
[REPT-84-29] N85-28281
Limiting profiles in contaminant transport through porous media
[REPT-84-31] N85-28282
A Navier-Stokes capillary free boundary in open boat crystal growth
[REPT-84-34] N85-28283
On the wind-induced vibrations of a mass-spring system
[REPT-84-04] N85-28428
Initial imperfection surveys on conical shells at Hoechst AG
[VTH-LR-407] N85-28429
Radar study of the melting layer
[ESA-CR(P)-1974] N85-28527
Perception of roll rate from an artificial horizon and peripheral displays
[VTH-LR-403] N85-28557
Ray tracing general sweep defined objects
[REPT-84-36] N85-28636
The interface with decision makers in interactive multiobjective linear programming
[REPT-84-38] N85-28637
Large scale electricity production scheduling via nonlinear optimization
[REPT-84-07] N85-28655
A fast implementation of explicit time stepping algorithms with the finite element method for a class of nonlinear evolution problems
[REPT-84-03] N85-28686
Relaxation methods for hyperbolic equations
[REPT-84-20] N85-28687
A note on integral operators
[REPT-83-26] N85-28688
Asymptotic expansion of Jacobi polynomials
[REPT-84-35] N85-28689
On the accuracy of the Poincare-Lindstedt method
[REPT-84-37] N85-28690
Fourier coding and reconstruction of complicated contours
[REPT-84-39] N85-28691
A multiple regression technique for detecting outliers
[REPT-84-33] N85-28706
Future directions in operations research
[REPT-84-24] N85-28711
Multicriteria decision analysis as an aid to strategic planning of energy research and development
[REPT-84-02] N85-28870

TECHNISCHE HOGESCHOOL, EINDHOVEN (NETHERLANDS).
Ohmic potential drop and gas bubble radius distribution in alkaline water electrolysis N85-28025
Oxygen evolution on NiCo2O4 electrodes N85-28026

TECHNISCHE UNIV., BRUNSWICK (WEST GERMANY).
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TECHNISCHE UNIV., HAMBURG (WEST GERMANY).
Assessment study of liquid content measurement methods applicable to space missions
[TU-HH-TRI-ESA-84-2] N85-28135

TEL-AVIV UNIV. (ISRAEL).
A seismic refraction profile across the Arabian Shield N85-28481

TENNESSEE TECHNOLOGICAL UNIV., COOKEVILLE.
SRB filament wound case material property study
[NASA-CR-171469] N85-27940
TENNESSEE UNIV., KNOXVILLE.
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[DE85-007538] N85-28747
TENNESSEE VALLEY AUTHORITY, CHATTANOOGA.
Test and evaluation of the Hoppecke Model E240G144/16 electric vehicle battery charger
[DE85-900573] N85-28253
TEXAS A&M UNIV., COLLEGE STATION.
The relationship between performance and satisfaction: A utility analysis
[AD-A152342] N85-28546
Predictors of transfer adjustment: A longitudinal study
[AD-A152462] N85-28548
Alphabet-constrained data compression
[AD-A152867] N85-28667
Luminescence probe studies of ionomers. I: Steady-state measurements from nafion membrane
[AD-A152475] N85-28730
TEXAS TECHNOLOGICAL UNIV., LUBBOCK.
Energy considerations in second breakdown
[AD-A152389] N85-28229
Spark gap electrode erosion
[AD-A152802] N85-28237
TEXAS UNIV., AUSTIN.
A greedy algorithm for the transhipment along a single road problem
[AD-A152343] N85-28709
The role of duality in optimization problems involving entropy functionals, with applications to information theory
[AD-A152336] N85-28713
Stability of high energy particle plasmas to MHD-like modes
[DE85-007879] N85-28803
I. F. S. (Institute for Fusion Studies) Newsletter, Volume 4, Number 1
[DE85-007917] N85-28809
TEXTRON BELL HELICOPTER, FORT WORTH, TEX.
Investigation of imaging and flight guidance concepts for rotorcraft zero visibility approach and landing
[NASA-CR-166571] N85-27843
TOKYO ASTRONOMICAL OBSERVATORY (JAPAN).
International time comparison by a GPS timing receiver N85-28293
TRANSAMERICA DELAVAL, INC., SANTA MONICA, CALIF.
Flow characteristics of a partially submerged liquid pickup
[DE85-008744] N85-28276
TRIMBLE NAVIGATION, MOUNTAIN VIEW, CALIF.
A new precision time and frequency source for stationary PTTI applications N85-28297
TRW DEFENSE AND SPACE SYSTEMS GROUP, REDONDO BEACH, CALIF.
Laboratory modeling of aspects of large fires
[AD-A153152] N85-28136

U

UHDE G.M.B.H., DORTMUND (WEST GERMANY).
Conversion of methanol to gasoline: Engineering and construction of the demonstration plant
[DE85-003237] N85-28133
UNION RHEINISCHE BRAUNKOHLEN KRAFTSTOFF A.G., WESSELING (WEST GERMANY).
Conversion of methanol to gasoline: Engineering and construction of the demonstration plant
[DE85-003237] N85-28133
UNITED KINGDOM ATOMIC ENERGY AUTHORITY, HARWELL (ENGLAND).
Neutron scattering and reactions on 59Co from 1 to 20 MeV
[AERE-R-11439] N85-28729
Time-integrated yield for the Joint European Torus (JET), April - September 1984
[AERE-M-3449] N85-28797
UNITED TECHNOLOGIES OF NEW MEXICO, INC., EAST HARTFORD, CONN.
High-thermal-gradient superalloy crystal growth N85-27966
UNITED TECHNOLOGIES RESEARCH CENTER, EAST HARTFORD, CONN.
Calculation of viscous compressible flows in small gas turbines N85-27950
Rotational relaxation studies of hydrogen fluoride
[AD-A152711] N85-28734
UNIVERSITY COLL. OF WALES, ABERYSTWYTH.
Scintillation using NNSS satellites
[AD-A152804] N85-28207
UNIVERSITY OF SOUTHERN CALIFORNIA, LOS ANGELES.
Elementary reactions of importance in oxidation, combustion ignition and flame inhibitions
[AD-A153139] N85-28004
Discrete mathematics for communications systems
[AD-A152814] N85-28684
Studies of optical-beam phase-conjugation by nonlinear refraction
[AD-A152865] N85-28788
UNIVERSITY OF SOUTHERN ILLINOIS, CARBONDALE.
Convex interpolating splines of arbitrary degree N85-28574
UOP, INC., DES PLAINES, ILL.
Michelle-derived catalysts for extended Schulz-Flory
[DE85-005656] N85-28012
UTAH UNIV., SALT LAKE CITY.
A survey of patch methods N85-28567
Triangular Berstein-Bezier patches, a survey and new results N85-28577
Morphological stability and fluid dynamics of vapor crystal growth
[NASA-CR-175879] N85-28822
Morphological stability and fluid dynamics of vapor crystal growth
[NASA-CR-175880] N85-28823
An experimental investigation of the angular scattering and backscattering behaviors of the simulated clouds of the outer planets
[NASA-CR-175909] N85-28896

V

VERMONT UNIV., BURLINGTON.
European Science Notes, Volume 39, Number 3
[AD-A152446] N85-28717
VIRGINIA POLYTECHNIC INST. AND STATE UNIV., BLACKSBURG.
Acoustooptic pulse-echo transducer system
[NASA-CR-175919] N85-28224
An experimental investigation of a turbulent junction vortex
[NASA-CR-175915] N85-28259
Application of forward scattering renormalization to scattering in turbid media
[AD-A153232] N85-28271
Measurement of ultrasonic fields in transparent media using a scanning differential interferometer
[NASA-CR-175921] N85-28726
VIRGINIA STATE UNIV., PETERSBURG.
Activities of the Solid State Physics Research Institute
[NASA-CR-175899] N85-28818
Muon spin rotation studies N85-28819
VIRGINIA UNIV., CHARLOTTESVILLE.
A unified representation scheme for solid geometric objects using B-splines (extended abstract) N85-28585
Research in computer science
[NASA-CR-175922] N85-28612
Spectroscopy of surface adsorbed molecules
[DE85-009452] N85-28768
Investigation of semiconductor clad optical waveguides
[NASA-CR-175870] N85-28785
VOUGHT CORP., DALLAS, TEX.
Computer program for prediction of capture maneuver probability for an on-off reaction controlled upper stage
[NASA-CR-165937] N85-28611

W

WASHINGTON UNIV., SEATTLE.
Average collisional vibrational energy transfer quantities and the inversion temperature
[AD-A152674] N85-28733
Spin distributions in heavy ion fusion at and below the Coulomb barrier
[DE85-007817] N85-28751
Coherent state description of non-topological solitons and momentum projection
[DE85-007814] N85-28761
Electroweak interactions in nuclei
[DE85-007811] N85-28762
High energy gamma rays from complex particle collisions
[DE85-007871] N85-28783
Special relativity of Kaluza-Klein
[DE85-007838] N85-28847
WESTINGHOUSE DEFENSE AND ELECTRONIC SYSTEMS CENTER, BALTIMORE, MD.
Analysis of time dependent dielectric failures
[AD-A153200] N85-28243
WESTINGHOUSE RESEARCH AND DEVELOPMENT CENTER, PITTSBURGH, PA.
Study to optimize Cr-Mo steels to resist hydrogen and temper embrittlement
[DE85-005492] N85-28096
WESTLAND AIRCRAFT LTD., YEOVIL (ENGLAND).
The evolution of active control technology systems for the 1990's helicopter N85-27911
WILKES COLL., WILKES-BARRE, PA.
Electrical research on solar cells and photovoltaic materials
[NASA-CR-175897] N85-28452
WISCONSIN UNIV., MADISON.
Centralized Storm Information System (CSIS)
[NASA-CR-175898] N85-28506
A report from the Space Science and Engineering Center, the University of Wisconsin-Madison, Madison, Wisconsin N85-28507
Test and evaluation plan for the Centralized Storm Information System N85-28508
Multicomputer operating systems and applications
[AD-A153205] N85-28648
Estimating random integrals from noisy observations: Sampling designs and their performance
[AD-A152926] N85-28702
Cosmic X-ray physics
[NASA-CR-175908] N85-28910
WOODS HOLE OCEANOGRAPHIC INSTITUTION, MASS.
Modern sedimentation in the northern Barents Sea: Input, dispersal and deposition of suspended sediments from glacial meltwater
[AD-A152520] N85-28530
WUERZBURG UNIV. (WEST GERMANY).
Activities report of the Institute of Astronomy and Astrophysics N85-28891
Activities report of the Institute of Astronomy and Astrophysics N85-28892

Y

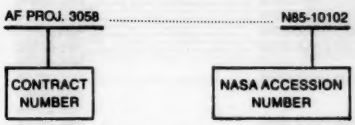
YALE UNIV., NEW HAVEN, CONN.
Efficient parallel solution of linear systems with hyperbolic rotations
[AD-A152355] N85-28661
Polynomial iteration for nonsymmetric indefinite linear systems
[AD-A153094] N85-28671
Robust regression through robust covariances
[AD-A153301] N85-28677
On the condition number of modified moment matrices arising from least squares approximation in the complex plane
[AD-A152353] N85-28714
YORK UNIV., DOWNSVIEW (ONTARIO).
The electronic spectra of phthalocyanine radical anions and cations
[AD-A152328] N85-27966

Z

ZEGER-ABRAMS, INC., GLENSIDE, PA.
Adaptive nulling at HF using a compact array of active parasitic antennas
[AD-A152582] N85-28203

CONTRACT NUMBER INDEX

Typical Contract Number Index Listing



Listings in this index are arranged alphanumerically by contract number. Under each contract number the NASA accession numbers denoting documents that have been produced as a result of research done under that contract are arranged in ascending order. The NASA accession number denotes the number by which the citation is identified.

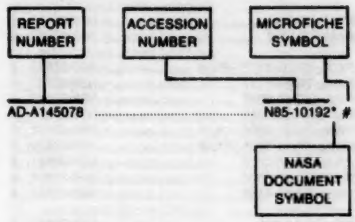
AF PROJ. 3D30 ..... N85-28226
AF PROJ. 06RA N85-28851
AF PROJ. 2302 ..... N85-28091
AF PROJ. 2307 ..... N85-27875
AF PROJ. 2310 ..... N85-28498
AF PROJ. 2311 ..... N85-28500
AF PROJ. 2338 ..... N85-28243
AF PROJ. 4594 ..... N85-28596
N85-28597
AF PROJ. 7184 ..... N85-28598
AF-AFOSR-0003-84 ..... N85-28667
AF-AFOSR-0015-84 ..... N85-28237
AF-AFOSR-0037-84 ..... N85-28207
AF-AFOSR-0095-84 ..... N85-28390
AF-AFOSR-0121-79 ..... N85-28802
AF-AFOSR-0140-84 ..... N85-28710
AF-AFOSR-0253-82 ..... N85-28616
AF-AFOSR-0258-82 ..... N85-28391
AF-AFOSR-0264-83 ..... N85-28739
AF-AFOSR-0372-83 ..... N85-28003
ARPA ORDER 3673 ..... N85-28197
ARPA ORDER 3797 ..... N85-28226
DA PROJ. 1L1-61102-A-31-B N85-28660
DA PROJ. 1L1-61102-AH-43 ..... N85-27993
N85-28265
DA PROJ. 1L1-61102-BH-57 ..... N85-28835
DA PROJ. 1L1-63309-AH-76 ..... N85-27916
DA PROJ. 2Q1-61102-B-74-F N85-28553
DA PROJ. 2Q1-62722-A-791 ..... N85-28880
DA PROJ. 3E1-62777-A-879 ..... N85-28540
DA PROJ. 3M1-61102-BS-10 ..... N85-28534
DA PROJ. 3T1-0 ..... N85-28197
DA PROJ. 4A0-61101-A-91-D N85-28659
DA PROJ. 718-4 ..... N85-28211
DAAG29-78-G-0110 ..... N85-28833
DAAG29-79-G-0012 ..... N85-27996
DAAG29-80-K-0004 ..... N85-28345
DAAG29-81-C-0012 ..... N85-28835
DAAG29-81-D-0100 ..... N85-28624
N85-28660
DAAG29-81-K-0006 ..... N85-28740
DAAG29-81-K-0048 ..... N85-28418
DAAG29-81-K-0090 ..... N85-28419
DAAG29-81-K-0094 ..... N85-29001
DAAG29-81-K-0102 ..... N85-28833
DAAG29-81-K-0107 ..... N85-28846
DAAG29-81-K-0121 ..... N85-28420
DAAG29-81-K-0162 ..... N85-28834
DAAG29-82-K-0021 ..... N85-28346
DAAG29-82-K-0022 ..... N85-28272
DAAG29-82-K-0023 ..... N85-27997
DAAG29-82-K-0025 ..... N85-27998
DAAG29-82-K-0026 ..... N85-28269
DAAG29-82-K-0043 ..... N85-29004
DAAG29-82-K-0045 ..... N85-28112
DAAG29-82-K-0048 ..... N85-28240
DAAG29-82-K-0054 ..... N85-28332
DAAG29-82-K-0056 ..... N85-28603
N85-28604
DAAG29-82-K-0059 ..... N85-28244
DAAG29-82-K-0168 ..... N85-28831
DAAG29-83-C-0017 ..... N85-28006
DAAG29-83-G-0113 ..... N85-28331
DAAG29-83-K-0164 ..... N85-28271
DAAG29-83-K-0178 ..... N85-28007
DAAG29-83-M-0415 ..... N85-27979
DAAG29-84-K-0078 ..... N85-28210
DAAG29-84-K-0202 ..... N85-28554
DAAG29-84-K-0207 ..... N85-28677
DAAK10-83-C-0155 ..... N85-28130
DAAK70-82-C-0001 ..... N85-28374
DAAK70-82-C-0095 ..... N85-28439
DAAK70-83-C-0026 ..... N85-28329
DAAK70-85-C-0007 ..... N85-28374
DACA72-84-C-0006 ..... N85-28627
DACA76-82-C-0003 ..... N85-28672
DAMD17-81-C-1136 ..... N85-28540
DARPA ORDER 5049 ..... N85-28648
DASG60-82-C-0007 ..... N85-28495
DE-AC02-76CH-00016 ..... N85-28015
N85-28017
N85-28095
N85-28101
N85-28114
N85-28348
N85-28748
N85-28758
N85-28759
N85-28760
N85-28769
N85-28771
DE-AC02-76CH-03000 ..... N85-28635
N85-28746
DE-AC02-76ER-00038 ..... N85-28022
DE-AC02-76ER-13065 ..... N85-28841
DE-AC02-76ET-26218 ..... N85-28455
DE-AC02-76ET-29368 ..... N85-28249
DE-AC02-76EV-02164 ..... N85-28536
DE-AC02-77CH-00178 ..... N85-28451
DE-AC02-78ET-51013 ..... N85-28754
DE-AC02-80ER-10587 ..... N85-28782
DE-AC02-81ER-10874 ..... N85-28537
DE-AC02-81ER-10996 ..... N85-28714
DE-AC02-81ER-40033 ..... N85-28749
DE-AC02-82ER12083 ..... N85-28016
DE-AC02-83CH-10093 ..... N85-28019
N85-28134
N85-28842
DE-AC02-83ER-13069 ..... N85-28629
DE-AC02-83ER-45006 ..... N85-28117
DE-AC02-84ER-13154 ..... N85-28021
DE-AC03-76SF-00093 ..... N85-28869
DE-AC03-76SF-00098 ..... N85-28097
N85-28098
N85-28100
N85-28248
N85-28744
N85-28752
N85-28764
N85-28767
N85-28773
DE-AC03-76SF-00515 ..... N85-28603
N85-28604
N85-28632
N85-28634
N85-28719
N85-28741
N85-28742
N85-28750
N85-28763
N85-28765
N85-28766
N85-28767
N85-28779
N85-28781
DE-AC03-80ER-10687 ..... N85-28276
DE-AC03-80EV-10407 ..... N85-28011
DE-AC03-84SF-12197 ..... N85-28453
DE-AC04-76DP-00078 ..... N85-28570
DE-AC04-76DP-00613 ..... N85-28602
DE-AC04-76DP-00789 ..... N85-28115
N85-28119
N85-28254
N85-28258
N85-28350
N85-28377
N85-28458
N85-28460
N85-28462
N85-28464
N85-28465
N85-28628
N85-28630
N85-28755
N85-28792
N85-28793
DE-AC05-76CR-01779 ..... N85-28426
DE-AC05-78ET-13513 ..... N85-28096
DE-AC05-84CR-21400 ..... N85-28116
N85-28721
DE-AC05-84CS-21400 ..... N85-28633
DE-AC05-84CT-21400 ..... N85-28277
DE-AC05-84OR-21400 ..... N85-28093
N85-28113
N85-28352
N85-28457
N85-28525
N85-28681
N85-28682
N85-28685
N85-28715
N85-28743
N85-28747
N85-28757
N85-28815
N85-28816
N85-28839
DE-AC05-85OR-21400 ..... N85-28335
DE-AC05-84OS-21400 ..... N85-28806
DE-AC06-76FF-02170 ..... N85-28094
DE-AC06-76RL-01830 ..... N85-27974
N85-28351
N85-28376
N85-28600
DE-AC06-81ER-40048 ..... N85-28751
N85-28761
N85-28762
N85-28783
N85-28847
DE-AC07-76ID-01570 ..... N85-28811
N85-28813
N85-28888
DE-AC08-83NV-10282 ..... N85-28255
DE-AC09-76SR-00001 ..... N85-28375
N85-28469
DE-AC21-81FE-15078 ..... N85-28454
DE-AC21-84MC-21129 ..... N85-28501
DE-AC22-80PC-30021 ..... N85-28014
DE-AC22-82PC-51258 ..... N85-28013
DE-AC22-84PC-70023 ..... N85-28012
DE-AI01-76ET-20356 ..... N85-28448
N85-28449
DE-AI01-77CS-51040 ..... N85-28109
DE-AI01-78CS-54209 ..... N85-28446
N85-28887
DE-AI05-83ER-60185 ..... N85-28018
DE-AM03-76SF-00010 ..... N85-28741
DE-AM04-80AL-13137 ..... N85-28445
N85-28447
DE-AM06-70RL-02227 ..... N85-28526
DE-AS06-83DP-40188 ..... N85-28814
DE-AS09-83ER-13098 ..... N85-28753
DE-AT03-76ER-72012 ..... N85-28274
DE-AT03-84ER-51044 ..... N85-28427
DE-AT03-84ER-53158 ..... N85-28720
DE-FG02-84ER-13212 ..... N85-28840
DE-FG02-84ER-45084 ..... N85-28119
DE-FG02-84ER-45112 ..... N85-28118
DE-FG02-84ER-45116 ..... N85-28099
DE-FG02-84ER-45158 ..... N85-28378
DE-FG05-80FT-53068 ..... N85-28803
N85-28809
DE-FG05-84ER-45072 ..... N85-28768
DE-FG05-84ER-45128 ..... N85-28122
DE-FG44-80R4-10280 ..... N85-28889
DEN3-17 ..... N85-28109
DLAH00-83-D-0225 ..... N85-28879

DNA001-83-C-0228 ..... N85-28138
DOT-FA01-80-Y-10546 ..... N85-28521
DOT-FA89NS-162 ..... N85-27917
DTFA01-80-Y-10524 ..... N85-28516
EPRI PROJ. 255-2 ..... N85-28249
ESA-5243/82/F-FC(SC) N85-27926
N85-27927
ESA-5261/82/F N85-27918
N85-27919
ESA-5602/83/F-FC(SC) N85-27928
ESOC-5759/83/D-IM(SC) N85-28903
ESTEC-5482/83/NL-GM(SC) N85-28527
ESTEC-5887/84/NL-PB(SC) N85-28135
FQ02-84ER-45095 ..... N85-28016
F55-59 ..... N85-28325
F83-521 ..... N85-28548
F04701-83-C-0084 ..... N85-28195
N85-28492
N85-28789
N85-28908
F19628-84-D-0016 ..... N85-28649
F19628-85-C-0002 ..... N85-28197
N85-28226
N85-28231
N85-28235
N85-28521
N85-28828
F29601-83-K-0014 ..... N85-28229
F30602-81-C-0062 ..... N85-28242
F30602-81-C-0242 ..... N85-28245
F33615-80-C-3229 ..... N85-27858
F33615-81-C-3201 ..... N85-28621
F33615-81-C-3605 ..... N85-27878
N85-27879
F33615-81-K-1429 ..... N85-28227
F33615-82-C-2262 ..... N85-28129
F33615-82-C-5001 ..... N85-28327
F49620-80-C-0001 ..... N85-28619
F49620-82-C-0009 ..... N85-28665
N85-28666
N85-28668
N85-28669
N85-28702
N85-28703
N85-28705
F49620-83-C-0005 ..... N85-28675
F49620-83-C-0045 ..... N85-28788
F49620-83-C-0098 ..... N85-28734
F49620-84-C-0014 ..... N85-28267
F49620-84-C-0044 ..... N85-28738
F49620-85-C-0008 ..... N85-28673
N85-28674
JPL-956786 ..... N85-28452
MDA903-82-C-0434 ..... N85-28800
MDA903-83-C-0047 ..... N85-28550
MDA903-84-C-0031 ..... N85-28522
NAGW-82 ..... N85-28696
NAGW-91 ..... N85-28907
NAGW-629 ..... N85-27936
NAGW-3476 ..... N85-28506
NAG1-103 ..... N85-28575
NAG1-242 ..... N85-28612
NAG1-263 ..... N85-28224
N85-28726
NAG1-296 ..... N85-28643
N85-28644
NAG1-409 ..... N85-28658
NAG1-416 ..... N85-28818
NAG1-17702 ..... N85-28785
NAG2-225 ..... N85-28106
NAG3-74 ..... N85-27867
NAG3-197 ..... N85-28127
NAG3-353 ..... N85-27869
NAG3-424 ..... N85-27868
NAG3-534 ..... N85-27959
NAG3-535 ..... N85-27957
NAG3-557 ..... N85-27922
NAG5-248 ..... N85-28824
NAG5-629 ..... N85-28910
NAG5-28209 ..... N85-28585
NAG8-305 ..... N85-28895
NASW-3425 ..... N85-28593
NASW-3838 ..... N85-28849
NASW-3950 ..... N85-28904
NASW-4004 ..... N85-27983
N85-27985
N85-28798
NASW-4006 ..... N85-27914
N85-27933
N85-27984
N85-28262
N85-28716
NAS1-13259 ..... N85-27855
N85-27856
NAS1-15000 ..... N85-28611
NAS1-15214 ..... N85-27824
N85-27825
NAS1-15326 ..... N85-27898
NAS1-17242 ..... N85-27930
NAS1-17425 ..... N85-28513
NAS2-11155 ..... N85-28893
NAS2-11364 ..... N85-27843
NAS2-11388 ..... N85-27886
NAS3-23928 ..... N85-28372
NAS3-24356 ..... N85-27971
NAS3-24382 ..... N85-27953
N85-27954
NAS3-24389 ..... N85-27955
N85-27956
NAS7-100 ..... N85-28461
NAS7-918 ..... N85-28190
N85-28191
N85-28192
N85-28193
N85-28286
N85-28445
N85-28446
N85-28447
N85-28448
N85-28449
N85-28512
N85-28529
N85-28559
N85-28887
NAS8-32853 ..... N85-27923
N85-27924
NAS8-33465 ..... N85-28221
NAS8-34906 ..... N85-28642
NAS8-35597 ..... N85-28511
NAS8-35672 ..... N85-27940
NAS8-35970 ..... N85-28261
NAS8-36144 ..... N85-28194
NAS8-36286 ..... N85-28108
NGL-22-009-124 ..... N85-28391
NIVR-1697 ..... N85-27860
NR PROJ. F59-551 ..... N85-28523
NR PROJ. RR0-1405 ..... N85-28423
NR PROJ. RR0-4208 ..... N85-28555
NR PROJ. 042-267 ..... N85-28856
NSF CHE-82-06130 ..... N85-27994
NSF ECS-82-04381 ..... N85-28579
NSF ECS-82-14081 ..... N85-28713
NSF ECS-82-16852 ..... N85-28423
NSF MCS-83-02654 ..... N85-28585
NSF PHY-83-18358 ..... N85-28773
NSG-1534 ..... N85-28822
N85-28823
NSG-1577 ..... N85-28581
NSG-2301 ..... N85-28259
NSG-7082 ..... N85-28905
NSG-7287 ..... N85-28907
NSG-7523 ..... N85-27915
N00014-75-C-0541 ..... N85-27989
N00014-75-C-0690 ..... N85-28733
N00014-76-C-0016 ..... N85-28496
N00014-76-C-0475 ..... N85-28704
N85-28856
N00014-77-C-0224 ..... N85-28391
N00014-78-C-0494 ..... N85-27990
N00014-78-C-0592 ..... N85-27986
N00014-79-C-0794 ..... N85-27988
N00014-80-C-0116 ..... N85-28087
N85-28088
N00014-80-C-0472 ..... N85-28344
N00014-80-C-0647 ..... N85-28233
N85-28663
N00014-80-C-0741 ..... N85-28701
N00014-81-C-0009 ..... N85-28530
N00014-81-C-0236 ..... N85-28713
N00014-81-C-2245 ..... N85-28090
N00014-81-K-0004 ..... N85-28623
N00014-81-K-0136 ..... N85-28594
N00014-81-K-0598 ..... N85-27994
N85-28735
N85-28736
N85-28737
N85-28830
N85-28845
N00014-81-K-0605 ..... N85-27987
N85-28228
N00014-82-C-0220 ..... N85-28342
N00014-82-C-0404 ..... N85-28270
N00014-82-C-2087 ..... N85-28648
N00014-82-K-0184 ..... N85-28661
N85-28671
N85-28714
N00014-82-K-0193 ..... N85-28595
N00014-82-K-0295 ..... N85-28709
N85-28713
N00014-82-K-0337 ..... N85-27998
N00014-82-K-0612 ..... N85-28730
N00014-83-G-0121 ..... N85-28603
N85-28604
N00014-83-K-0069 ..... N85-28008
N00014-83-K-0074 ..... N85-28549
N00014-83-K-0268 ..... N85-28009
N85-28238
N85-28343
N00014-83-K-0388 ..... N85-28548
N85-28548
N00014-83-K-0472 ..... N85-28603
N85-28604
N00014-83-K-0756 ..... N85-28867
N00014-84-C-0446 ..... N85-28539
N00014-84-C-0483 ..... N85-28654
N00014-84-C-2014 ..... N85-28330
N00014-84-C-2032 ..... N85-28497
N00014-84-K-0009 ..... N85-28552
N85-28555
N00014-84-K-0016 ..... N85-28852
N85-28853
N85-28854
N00014-84-K-0049 ..... N85-28727
N00014-84-K-0092 ..... N85-28661
N00014-84-K-0189 ..... N85-28664
N00014-84-K-0301 ..... N85-28699
N85-28700
N00014-84-K-0365 ..... N85-27995
N00014-84-K-0387 ..... N85-28731
N85-28732
N00015-84-K-0009 ..... N85-28551
N00019-82-C-0066 ..... N85-28832
N00039-81-C-0357 ..... N85-28209
N00039-82-C-0235 ..... N85-28579
N00039-84-C-0070 ..... N85-28209
N00173-78-C-0265 ..... N85-28203
N00228-83-C-3073 ..... N85-28523
N00228-83-C-3122 ..... N85-28524
ONR PROJ. 051-549 ..... N85-28238
W-31-109-ENG-38 ..... N85-27982
N85-28020
N85-28092
N85-28120
N85-28379
N85-28380
N85-28425
N85-28468
N85-28629
N85-28810
N85-28906
W-7405-ENG-36 ..... N85-27925
N85-28347
N85-28466
N85-28678
N85-28680
N85-28684
N85-28772
N85-28804
N85-28807
N85-28812
N85-28902
W-7405-ENG-48 ..... N85-28010
N85-28247
N85-28251
N85-28252
N85-28334
N85-28349
N85-28392
N85-28456
N85-28601
N85-28631
N85-28683
N85-28767
N85-28808
N85-28839
N85-28868
W-7405-ENG-82 ..... N85-28637
WR0421 ..... N85-28544
ZWO-125-20-40 ..... N85-28639
314-30-53-20-02 ..... N85-28193
422-50-06 ..... N85-28893
505-23-72 ..... N85-28373
505-31-01 ..... N85-27823
N85-27828
505-31-01-01-00-21 ..... N85-28284
505-31-04 ..... N85-27870
505-31-42 ..... N85-27869
505-31-53-10 ..... N85-27915
505-31-83-02 ..... N85-28563
505-33-7A N85-27978
N85-28371
505-33-43-09 ..... N85-27824
N85-27825
505-33-53-09 ..... N85-27852
505-33-90-01 ..... N85-27977
505-34-13 ..... N85-28609
505-40-66 ..... N85-28798
505-42-23-09 ..... N85-27916

505-42-94 ..... N85-28372
505-43-23-03 ..... N85-27822
505-45-12 ..... N85-27839
506-53-43-01 ..... N85-27934
506-55-22 ..... N85-27972
506-55-52 ..... N85-28444
506-55-72 ..... N85-28110
N85-28222
532-01-11 ..... N85-27843
533-04-1A N85-27867
553-13-00 ..... N85-27941
590-02-02 ..... N85-28611
619-12-30-01 ..... N85-28513
776-52-62-02 ..... N85-28446
776-81-62-03 ..... N85-28449
776-781-62-03 ..... N85-28445
778-36-05-01 ..... N85-28887

REPORT / ACCESSION NUMBER INDEX

Typical Report / Accession Number Index Listing



Listings in this index are arranged alphanumerically by report number. The NASA accession number denotes the number by which the citation is identified. An asterisk (*) indicates that the item is a NASA report. A pound sign (#) indicates that the item is available on microfiche.

A-85100 ..... N85-27823* #

AD-A149163 ..... N85-28287 #
AD-A151051 ..... N85-28397 #
AD-A151746 ..... N85-28195 #
AD-A151843 ..... N85-28659 #
AD-A151883 ..... N85-28196 #
AD-A152317 ..... N85-28543 #
AD-A152318 ..... N85-28787 #
AD-A152320 ..... N85-28492 #
AD-A152321 ..... N85-28544 #
AD-A152323 ..... N85-28111 #
AD-A152328 ..... N85-27986 #
AD-A152329 ..... N85-28197 #
AD-A152330 ..... N85-28198 #
AD-A152334 ..... N85-28908 #
AD-A152336 ..... N85-28713 #
AD-A152337 ..... N85-28545 #
AD-A152338 ..... N85-28199 #
AD-A152340 ..... N85-28226 #
AD-A152341 ..... N85-28828 #
AD-A152342 ..... N85-28546 #
AD-A152343 ..... N85-28709 #
AD-A152346 ..... N85-28493 #
AD-A152351 ..... N85-28660 #
AD-A152353 ..... N85-28714 #
AD-A152355 ..... N85-28661 #
AD-A152360 ..... N85-28227 #
AD-A152361 ..... N85-28547 #
AD-A152367 ..... N85-28087 #
AD-A152369 ..... N85-27844 #
AD-A152370 ..... N85-28200 #
AD-A152372 ..... N85-28518 #
AD-A152376 ..... N85-28699 #
AD-A152377 ..... N85-28700 #
AD-A152378 ..... N85-28228 #
AD-A152379 ..... N85-27987 #
AD-A152381 ..... N85-28201 #
AD-A152382 ..... N85-27988 #
AD-A152383 ..... N85-28494 #
AD-A152387 ..... N85-27989 #
AD-A152389 ..... N85-28229 #
AD-A152394 ..... N85-27990 #
AD-A152398 ..... N85-28800 #
AD-A152399 ..... N85-28727 #
AD-A152400 ..... N85-28230 #
AD-A152415 ..... N85-27863 #
AD-A152418 ..... N85-28088 #
AD-A152444 ..... N85-28437 #
AD-A152446 ..... N85-28717 #
AD-A152455 ..... N85-28718 #
AD-A152460 ..... N85-28438 #
AD-A152461 ..... N85-28231 #
AD-A152462 ..... N85-28548 #
AD-A152463 ..... N85-28549 #
AD-A152466 ..... N85-28629 #
AD-A152467 ..... N85-28850 #
AD-A152469 ..... N85-28202 #
AD-A152475 ..... N85-28730 #
AD-A152476 ..... N85-28851 #
AD-A152477 ..... N85-28089 #

AD-A152478 ..... N85-28450 #
AD-A152480 ..... N85-28325 #
AD-A152519 ..... N85-28654 #
AD-A152520 ..... N85-28530 #
AD-A152528 ..... N85-28519 #
AD-A152529 ..... N85-28232 #
AD-A152531 ..... N85-27932 #
AD-A152539 ..... N85-28662 #
AD-A152540 ..... N85-28128 #
AD-A152550 ..... N85-28520 #
AD-A152551 ..... N85-27845 #
AD-A152563 ..... N85-28521 #
AD-A152581 ..... N85-28495 #
AD-A152582 ..... N85-28203 #
AD-A152585 ..... N85-27846 #
AD-A152595 ..... N85-28090 #
AD-A152598 ..... N85-28852 #
AD-A152602 ..... N85-28853 #
AD-A152603 ..... N85-28854 #
AD-A152606 ..... N85-28374 #
AD-A152607 ..... N85-28701 #
AD-A152616 ..... N85-27875 #
AD-A152619 ..... N85-28204 #
AD-A152625 ..... N85-27991 #
AD-A152627 ..... N85-27876 #
AD-A152628 ..... N85-28205 #
AD-A152632 ..... N85-28731 #
AD-A152639 ..... N85-28732 #
AD-A152653 ..... N85-28265 #
AD-A152655 ..... N85-28901 #
AD-A152657 ..... N85-28340 #
AD-A152659 ..... N85-28206 #
AD-A152661 ..... N85-28233 #
AD-A152663 ..... N85-28663 #
AD-A152664 ..... N85-28326 #
AD-A152665 ..... N85-28614 #
AD-A152674 ..... N85-28733 #
AD-A152679 ..... N85-28234 #
AD-A152681 ..... N85-28615 #
AD-A152689 ..... N85-27831 #
AD-A152690 ..... N85-28728 #
AD-A152701 ..... N85-28801 #
AD-A152703 ..... N85-28235 #
AD-A152708 ..... N85-28830 #
AD-A152709 ..... N85-28845 #
AD-A152710 ..... N85-27992 #
AD-A152711 ..... N85-28734 #
AD-A152712 ..... N85-28341 #
AD-A152714 ..... N85-28496 #
AD-A152715 ..... N85-28616 #
AD-A152716 ..... N85-28617 #
AD-A152730 ..... N85-28855 #
AD-A152731 ..... N85-28539 #
AD-A152734 ..... N85-27993 #
AD-A152735 ..... N85-28522 #
AD-A152740 ..... N85-27994 #
AD-A152760 ..... N85-28735 #
AD-A152762 ..... N85-28736 #
AD-A152763 ..... N85-28737 #
AD-A152800 ..... N85-28738 #
AD-A152801 ..... N85-28129 #
AD-A152802 ..... N85-28237 #
AD-A152804 ..... N85-28207 #
AD-A152805 ..... N85-28497 #
AD-A152812 ..... N85-28390 #
AD-A152814 ..... N85-28664 #
AD-A152819 ..... N85-28594 #
AD-A152820 ..... N85-28498 #
AD-A152821 ..... N85-27995 #
AD-A152827 ..... N85-28665 #
AD-A152828 ..... N85-28856 #
AD-A152856 ..... N85-28666 #
AD-A152857 ..... N85-28618 #
AD-A152858 ..... N85-27937 #
AD-A152865 ..... N85-28788 #
AD-A152876 ..... N85-27996 #
AD-A152877 ..... N85-27917 #
AD-A152878 ..... N85-28236 #
AD-A152879 ..... N85-28739 #
AD-A152887 ..... N85-28667 #
AD-A152888 ..... N85-27979 #
AD-A152917 ..... N85-28342 #
AD-A152921 ..... N85-28391* #

AD-A152924 ..... N85-28619 #
AD-A152926 ..... N85-28702 #
AD-A152927 ..... N85-28703 #
AD-A152928 ..... N85-28343 #
AD-A152932 ..... N85-28668 #
AD-A152951 ..... N85-28239 #
AD-A152953 ..... N85-28645 #
AD-A152954 ..... N85-28620 #
AD-A152958 ..... N85-28417 #
AD-A152959 ..... N85-28499 #
AD-A152960 ..... N85-27997 #
AD-A152961 ..... N85-28646 #
AD-A152970 ..... N85-28595 #
AD-A152986 ..... N85-28534 #
AD-A152988 ..... N85-28327 #
AD-A152989 ..... N85-27998 #
AD-A152991 ..... N85-28802 #
AD-A152993 ..... N85-27999 #
AD-A152994 ..... N85-28000 #
AD-A152995 ..... N85-28130 #
AD-A153000 ..... N85-28878 #
AD-A153014 ..... N85-28596 #
AD-A153016 ..... N85-28523 #
AD-A153017 ..... N85-28669 #
AD-A153020 ..... N85-28266 #
AD-A153031 ..... N85-28879 #
AD-A153039 ..... N85-28328 #
AD-A153040 ..... N85-27980 #
AD-A153043 ..... N85-28866 #
AD-A153047 ..... N85-28001 #
AD-A153048 ..... N85-28002 #
AD-A153051 ..... N85-28131 #
AD-A153063 ..... N85-28789 #
AD-A153065 ..... N85-28208 #
AD-A153071 ..... N85-28670 #
AD-A153079 ..... N85-28003 #
AD-A153083 ..... N85-28344 #
AD-A153084 ..... N85-28418 #
AD-A153085 ..... N85-28524 #
AD-A153086 ..... N85-28267 #
AD-A153087 ..... N85-28268 #
AD-A153089 ..... N85-28597 #
AD-A153090 ..... N85-27871 #
AD-A153094 ..... N85-28671 #
AD-A153099 ..... N85-28240 #
AD-A153100 ..... N85-27877 #
AD-A153101 ..... N85-28241 #
AD-A153102 ..... N85-28540 #
AD-A153111 ..... N85-28242 #
AD-A153112 ..... N85-28672 #
AD-A153114 ..... N85-28419 #
AD-A153116 ..... N85-28674 #
AD-A153120 ..... N85-28209 #
AD-A153121 ..... N85-28132 #
AD-A153125 ..... N85-28831 #
AD-A153126 ..... N85-28740 #
AD-A153128 ..... N85-28704 #
AD-A153129 ..... N85-28400 #
AD-A153133 ..... N85-28832 #
AD-A153134 ..... N85-28112 #
AD-A153135 ..... N85-28420 #
AD-A153136 ..... N85-28421 #
AD-A153139 ..... N85-28004 #
AD-A153142 ..... N85-28621 #
AD-A153144 ..... N85-28005 #
AD-A153145 ..... N85-28550 #
AD-A153152 ..... N85-28138 #
AD-A153156 ..... N85-28329 #
AD-A153157 ..... N85-28705 #
AD-A153158 ..... N85-28710 #
AD-A153161 ..... N85-27858 #
AD-A153168 ..... N85-28551 #
AD-A153169 ..... N85-28269 #
AD-A153172 ..... N85-28833 #
AD-A153173 ..... N85-27878 #
AD-A153174 ..... N85-28647 #
AD-A153175 ..... N85-27938 #
AD-A153180 ..... N85-28535 #
AD-A153193 ..... N85-28270 #
AD-A153198 ..... N85-28006 #
AD-A153199 ..... N85-28834 #
AD-A153200 ..... N85-28243 #
AD-A153202 ..... N85-28007 #

AD-A153205 N85-28648 #
AD-A153206 N85-27973 #
AD-A153209 N85-28552 #
AD-A153210 N85-28345 #
AD-A153212 N85-28330 #
AD-A153213 N85-28778 #
AD-A153214 N85-28649 #
AD-A153222 N85-28422 #
AD-A153223 N85-28091 #
AD-A153224 N85-28210 #
AD-A153228 N85-28553 #
AD-A153229 N85-28880 #
AD-A153232 N85-28271 #
AD-A153241 N85-28911 #
AD-A153242 N85-28500 #
AD-A153243 N85-28835 #
AD-A153247 N85-28675 #
AD-A153249 N85-28622 #
AD-A153252 N85-28676 #
AD-A153263 N85-27981 #
AD-A153264 N85-28244 #
AD-A153267 N85-28331 #
AD-A153268 N85-28245 #
AD-A153269 N85-27939 #
AD-A153275 N85-28423 #
AD-A153276 N85-28598 #
AD-A153280 N85-28623 #
AD-A153282 N85-28211 #
AD-A153297 N85-28212 #
AD-A153298 N85-28867 #
AD-A153299 N85-28246 #
AD-A153300 N85-27879 #
AD-A153301 N85-28677 #
AD-A153302 N85-28006 #
AD-A153303 N85-27832 #
AD-A153318 N85-28439 #
AD-A153322 N85-28624 #
AD-A153323 N85-28625 #
AD-A153347 N85-28424 #
AD-A153362 N85-28009 #
AD-A153364 N85-28554 #
AD-A153365 N85-28332 #
AD-A153366 N85-28346 #
AD-A153370 N85-28555 #
AD-A153376 N85-27859 #
AD-A153378 N85-28626 #
AD-A153379 N85-28627 #
AD-A153387 N85-28846 #
AD-A153401 N85-28272 #
AD-A153404 N85-28541 #

AD-D011598 N85-28225 #
AD-D011621 N85-28236 #
AD-D011634 N85-28560 #
AD-D011635 N85-28218
AD-D011638 N85-28333 #
AD-D011639 N85-28599 #
AD-D011640 N85-27865
AD-D011641 N85-27866
AD-D011642 N85-28784
AD-D011643 N85-28086
AD-D011644 N85-28219
AD-D011646 N85-28790 #
AD-D011647 N85-28213 #
AD-D011648 N85-28505
AD-D011649 N85-28105
AD-D011650 N85-28339
AD-D011651 N85-28791 #
AD-D011652 N85-28220
AD-D011653 N85-28443
AD-D011654 N85-28273 #
AD-D011655 N85-28836 #

AD-E301615 N85-28138 #
AD-E301651 N85-28801 #
AD-E401306 N85-27999 #
AD-E401306 N85-28000 #
AD-E401306 N85-28130 #
AD-E440273 N85-28089 #
AD-E440273 N85-28202 #
AD-E440273 N85-28548 #
AD-E440273 N85-28549 #
AD-E440273 N85-28730 #
AD-E440273 N85-28829 #
AD-E440273 N85-28850 #
AD-E440273 N85-28851 #
AD-E440274 N85-28424 #
AD-E440275 N85-28539 #
AD-E440275 N85-28855 #
AD-E500705 N85-28522 #
AD-E750971 N85-27994 #
AD-E801113 N85-28541 #
AD-E900434 N85-27844 #
AD-E900434 N85-27987 #
AD-E900434 N85-27988 #
AD-E900434 N85-28087 #

AD-E900434 N85-28200 #
AD-E900434 N85-28201 #
AD-E900434 N85-28226 #
AD-E900434 N85-28494 #
AD-E900434 N85-28518 #
AD-E900434 N85-28699 #
AD-E900434 N85-28700 #
AD-E900438 N85-28450 #
AD-E900442 N85-28[illegible] #

AD-F300598 N85-27993 #
AD-F300599 N85-28265 #
AD-F300599 N85-28732 #
AD-F300600 N85-28002 #
AD-F300602 N85-28131 #
AD-F630700 N85-28670 #

AD-P004562 N85-28857 #
AD-P004563 N85-28858 #
AD-P004564 N85-28859 #
AD-P004565 N85-28860 #
AD-P004566 N85-28861 #
AD-P004567 N85-28862 #
AD-P004568 N85-28863 #
AD-P004569 N85-28865 #
AD-P004570 N85-28864 #
AD-P004578 N85-28295 #

AEDC-TR-84-03 N85-28263* #
AEDC-TR-85-10 N85-27991 #

AERE-M-3449 N85-28797

AERE-R-11439 N85-28729

AFAMRL-TP-85-300 N85-28211 #

AFAMRL-TR-85-007 N85-28598 #

AFGL-TR-85-0021 N85-28500 #
AFGL-TR-85-0052 N85-28498 #
AFGL-TR-85-0053 N85-28207 #

AFIT/GA/AA/84D-2 N85-27938 #
AFIT/GA/AA/84D-3 N85-27939 #
AFIT/GA/AA/84D-4 N85-28241 #
AFIT/GA/AA/84D-5 N85-28421 #
AFIT/GA/AA/84D-7 N85-27937 #
AFIT/GA/AA/84D-8 N85-28676 #
AFIT/GA/AA/84D-9 N85-28132 #

AFIT/GA/ENG/84D-3 N85-28778 #

AFIT/GAE/AA/84D-3 N85-28328 #
AFIT/GAE/AA/84D-5 N85-27980 #
AFIT/GAE/AA/84D-6 N85-27871 #
AFIT/GAE/AA/84D-7 N85-27832 #
AFIT/GAE/AA/84D-8 N85-28091 #
AFIT/GAE/AA/84D-12 N85-27981 #
AFIT/GAE/AA/84D-15 N85-28417 #
AFIT/GAE/AA/84D-20 N85-28422 #
AFIT/GAE/AA/84D-22 N85-28268 #

AFIT/GCS/ENG/84D-4 N85-28647 #
AFIT/GCS/ENG/84D-4-VOL-1 N85-28645 #
AFIT/GCS/ENG/84D-20-VOL-1 N85-28866 #
AFIT/GCS/ENG/84D-26 N85-28618 #
AFIT/GCS/ENG/84D-30 N85-28535 #

AFIT/GCS/MATH/84D-2 N85-28626 #
AFIT/GCS/MATH/84D-5 N85-28620 #
AFIT/GCS/MATH/84D-6 N85-28625 #

AFIT/GE/ENG/84D-41 N85-28829 #
AFIT/GE/ENG/84D-49 N85-28622 #
AFIT/GE/ENG/84D-72 N85-27877 #

AFIT/GEO/ENP/84D-4 N85-28787 #

AFIT/GSO/PH-OS/84D-2 N85-28499 #

AFLRL-178 N85-28374 #

AFOSR-85-0198TR N85-28267 #
AFOSR-85-0275TR N85-28616 #
AFOSR-85-0279TR N85-28602 #
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AFOSR-85-0337TR N85-28674 #
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AFOSR-85-0348TR N85-28666 #

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AFTAC-TR-85-2 N85-27932 #

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AFWAL-TR-84-2049 N85-28129 #
AFWAL-TR-84-3045 N85-27875 #
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AFWAL-TR-84-3060-VOL-2 N85-27879 #
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AFWAL-TR-84-4159 N85-28327 #

AFWL-TR-84-111 N85-28229 #

AGARD-CP-384 N85-27883 #

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AR-6 N85-28890 #
AR-004-105 N85-28223 #
AR-004-322 N85-28799 #

ARAP-535 N85-28523 #

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ARI-TR-648 N85-28880 #
ARI-TR-658 N85-28553 #

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ARLCB-TR-85006 N85-28424 #

ARLCD-CR-85006 N85-28130 #

ARO-15557.10-CH N85-28833 #
ARO-16004.11-CH N85-27996 #
ARO-16436.7-EL N85-28345 #
ARO-17235.7-PH N85-28740 #
ARO-17654.4-CH N85-28001 #
ARO-17721.7EL N85-28835 #
ARO-17758.28-EG N85-28419 #
ARO-17687.1-MS N85-28418 #
ARO-18210.7-MA N85-28846 #
ARO-18271.29-CH N85-28833 #
ARO-18428.9-EG N85-27997 #
ARO-18509.51-EL N85-28244 #
ARO-18514.29-CH N85-28004 #
ARO-18522.7-CH N85-28332 #
ARO-18578.19-PH N85-28346 #
ARO-18595.5-MA N85-28269 #
ARO-18611.7-EG N85-28272 #
ARO-18667.15-CH N85-27996 #
ARO-18762.7-MS N85-28834 #
ARO-18930.19-CH N85-28112 #
ARO-18978.8-CH N85-28240 #
ARO-19367.24-MA N85-28831 #
ARO-20079.1-MS N85-28006 #
ARO-20705.2-GS N85-28271 #
ARO-21126.1-PH-H N85-28331 #
ARO-21152.1-MS-CF N85-27979 #
ARO-21312.1-CH-R N85-28007 #
ARO-21378.1-EL N85-28210 #
ARO-21779.2-MA N85-28677 #
ARO-22000.1-LS N85-28554 #

ATR-85(7899)-1 N85-28011 #

AVSCOM-TM-85-B-1 ..... N85-27916* #

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BF-TD-DRD-03-VOL-2 ..... N85-27919 #

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CCS-500 ..... N85-28709 #

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DE85-007246 ..... N85-28251 #
DE85-007252 ..... N85-28334 #
DE85-007261 ..... N85-28839 #
DE85-007288 ..... N85-28840 #
DE85-007304 ..... N85-28601 #
DE85-007416 ..... N85-28841 #
DE85-007417 ..... N85-28452 #
DE85-007426 ..... N85-27974 #
DE85-007455 ..... N85-28782 #
DE85-007462 ..... N85-28094 #
DE85-007515 ..... N85-28746 #
DE85-007519 ..... N85-28808 #
DE85-007538 ..... N85-28747 #
DE85-007540 ..... N85-28806 #
DE85-007568 ..... N85-28525 #
DE85-007575 ..... N85-28757 #
DE85-007610 ..... N85-28275 #
DE85-007625 ..... N85-28744 #
DE85-007626 ..... N85-28752 #
DE85-007636 ..... N85-28812 #
DE85-007654 ..... N85-28097 #
DE85-007656 ..... N85-28098 #
DE85-007663 ..... N85-28902 #
DE85-007674 ..... N85-28772 #
DE85-007678 ..... N85-28347 #
DE85-007679 ..... N85-28804 #
DE85-007683 ..... N85-28807 #
DE85-007688 ..... N85-28254 #
DE85-007693 ..... N85-28022 #
DE85-007713 ..... N85-28121 #
DE85-007730 ..... N85-28425 #
DE85-007764 ..... N85-28600 #
DE85-007811 ..... N85-28762 #
DE85-007814 ..... N85-28761 #
DE85-007817 ..... N85-28751 #
DE85-007838 ..... N85-28847 #
DE85-007864 ..... N85-28023 #
DE85-007871 ..... N85-28783 #
DE85-007873 ..... N85-28459 #
DE85-007879 ..... N85-28803 #
DE85-007884 ..... N85-28115 #
DE85-007887 ..... N85-28350 #
DE85-007892 ..... N85-28754 #
DE85-007910 ..... N85-28469 #
DE85-007917 ..... N85-28809 #
DE85-007919 ..... N85-28603 #
DE85-007927 ..... N85-28748 #
DE85-007932 ..... N85-28020 #
DE85-007945 ..... N85-27982 #
DE85-007946 ..... N85-28810 #
DE85-007948 ..... N85-28906 #
DE85-007974 ..... N85-28392 #
DE85-007976 ..... N85-28683 #
DE85-007992 ..... N85-28092 #
DE85-008029 ..... N85-28628 #
DE85-008038 ..... N85-28811 #
DE85-008040 ..... N85-28813 #
DE85-008054 ..... N85-28750 #
DE85-008056 ..... N85-28742 #
DE85-008064 ..... N85-28745 #
DE85-008102 ..... N85-28011 #
DE85-008106 ..... N85-28274 #
DE85-008116 ..... N85-28805 #
DE85-008117 ..... N85-28456 #
DE85-008121 ..... N85-28629 #
DE85-008127 ..... N85-28335 #
DE85-008133 ..... N85-28537 #
DE85-008149 ..... N85-28685 #
DE85-008152 ..... N85-28093 #
DE85-008154 ..... N85-28633 #
DE85-008170 ..... N85-28838 #
DE85-008174 ..... N85-28763 #
DE85-008175 ..... N85-28765 #
DE85-008176 ..... N85-28719 #
DE85-008177 ..... N85-28760 #
DE85-008178 ..... N85-28741 #
DE85-008209 ..... N85-28793 #
DE85-008245 ..... N85-28453 #
DE85-008247 ..... N85-28536 #
DE85-008261 ..... N85-28375 #
DE85-008276 ..... N85-28427 #
DE85-008279 ..... N85-28501 #
DE85-008280 ..... N85-28720 #
DE85-008282 ..... N85-28095 #
DE85-008284 ..... N85-28770 #
DE85-008287 ..... N85-28015 #
DE85-008289 ..... N85-28758 #
DE85-008294 ..... N85-28348 #
DE85-008298 ..... N85-28016 #
DE85-008320 ..... N85-28604 #

DE85-008326 ..... N85-28460 #
DE85-008327 ..... N85-28814 #
DE85-008392 ..... N85-28602 #
DE85-008396 ..... N85-28462 #
DE85-008398 ..... N85-28464 #
DE85-008400 ..... N85-28630 #
DE85-008427 ..... N85-28463 #
DE85-008446 ..... N85-28100 #
DE85-008447 ..... N85-28764 #
DE85-008453 ..... N85-28773 #
DE85-008465 ..... N85-28767 #
DE85-008473 ..... N85-28465 #
DE85-008475 ..... N85-28458 #
DE85-008545 ..... N85-28426 #
DE85-008583 ..... N85-28755 #
DE85-008627 ..... N85-28466 #
DE85-008679 ..... N85-28869 #
DE85-008685 ..... N85-28681 #
DE85-008695 ..... N85-28792 #
DE85-008744 ..... N85-28276 #
DE85-008753 ..... N85-28457 #
DE85-008757 ..... N85-28816 #
DE85-008761 ..... N85-28715 #
DE85-008762 ..... N85-28682 #
DE85-008768 ..... N85-28542 #
DE85-008823 ..... N85-28753 #
DE85-008873 ..... N85-28631 #
DE85-008879 ..... N85-28349 #
DE85-008896 ..... N85-28252 #
DE85-008897 ..... N85-28250 #
DE85-008898 ..... N85-28247 #
DE85-008902 ..... N85-28684 #
DE85-008930 ..... N85-28101 #
DE85-008974 ..... N85-28526 #
DE85-009040 ..... N85-28018 #
DE85-009107 ..... N85-28119 #
DE85-009115 ..... N85-28634 #
DE85-009288 ..... N85-28721 #
DE85-009291 ..... N85-28815 #
DE85-009299 ..... N85-28632 #
DE85-009318 ..... N85-28122 #
DE85-009357 ..... N85-28021 #
DE85-009367 ..... N85-28635 #
DE85-009431 ..... N85-28351 #
DE85-009452 ..... N85-28768 #
DE85-009457 ..... N85-28352 #
DE85-009519 ..... N85-28461* #
DE85-009530 ..... N85-28099 #
DE85-009533 ..... N85-28118 #
DE85-009722 ..... N85-28117 #
DE85-009776 ..... N85-28120 #
DE85-009802 ..... N85-28277 #
DE85-009874 ..... N85-28255 #
DE85-009964 ..... N85-28256 #
DE85-009965 ..... N85-28377 #
DE85-010019 ..... N85-28376 #
DE85-900430 ..... N85-28756 #
DE85-900573 ..... N85-28253 #

DFVLR-FB-84-12 ..... N85-27880 #
DFVLR-FB-84-46 ..... N85-28285 #
DFVLR-FB-84-48 ..... N85-27881 #
DFVLR-FB-84-49 ..... N85-27837 #
DFVLR-FB-84-50 ..... N85-27862 #
DFVLR-FB-84-51 ..... N85-28558 #
DFVLR-FB-84-52 ..... N85-27882 #
DFVLR-FB-85-01-PT-2 ..... N85-27833 #
DFVLR-FB-85-02 ..... N85-28336 #
DFVLR-FB-85-03 ..... N85-28471 #
DFVLR-FB-85-04 ..... N85-27920 #
DFVLR-FB-85-05 ..... N85-27838 #
DFVLR-FB-85-06 ..... N85-28442 #
DFVLR-FB-85-07 ..... N85-28215 #
DFVLR-FB-85-09 ..... N85-28472 #

DFVLR-IB-222-84-A-37 ..... N85-27912

DFVLR-MITT-84-02 ..... N85-28503 #
DFVLR-MITT-84-20 ..... N85-27850 #
DFVLR-MITT-85-01 ..... N85-27864 #
DFVLR-MITT-85-02 ..... N85-29504 #
DFVLR-MITT-85-03 ..... N85-27921 #

DIN-71500-PT-1 ..... N85-28361

DNA-TR-84-18 ..... N85-28138 #

DOE/CE-T11 ..... N85-28463 #

DOE/CE-0027/3 ..... N85-28890 #
DOE/CE-0100 ..... N85-28275 #

DOE/CS-30265/T5 ..... N85-28459 #
DOE/CS-54209/22 ..... N85-28887* #

DOE/DP-40188/1 ..... N85-28814 #

DOE/ER-0076/2 ..... N85-28805 #
DOE/ER-00038/2655 ..... N85-28022 #
DOE/ER-10587/3 ..... N85-28782 #
DOE/ER-10687/T2 ..... N85-28276 #
DOE/ER-13065/408 ..... N85-28841 #
DOE/ER-13098/2 ..... N85-28753 #
DOE/ER-13154/3 ..... N85-28021 #
DOE/ER-13212/1 ..... N85-28840 #
DOE/ER-40033/71 ..... N85-28749 #
DOE/ER-40048/06-N4 ..... N85-28762 #
DOE/ER-40048/11-N4 ..... N85-28761 #
DOE/ER-40048/26-P4 ..... N85-28847 #
DOE/ER-40048/101-L4 ..... N85-28751 #
DOE/ER-40048/113-L4 ..... N85-28783 #
DOE/ER-45006/T1 ..... N85-28117 #
DOE/ER-45072/T1 ..... N85-28788 #
DOE/ER-45112/1 ..... N85-28118 #
DOE/ER-45116/5 ..... N85-28099 #
DOE/ER-45128/T1 ..... N85-28122 #
DOE/ER-45158/T1 ..... N85-28378 #
DOE/ER-60185/T2 ..... N85-28018 #
DOE/ER-72012/T2 ..... N85-28274 #

DOE/ET-13513/1 ..... N85-28096 #
DOE/ET-20356/22 ..... N85-28446* #
DOE/ET-20356/24 ..... N85-28448* #
DOE/ET-53088/T1 ..... N85-28809 #
DOE/ET-53088/131 ..... N85-28803 #

DOE/EV-02164/11 ..... N85-28536 #

DOE/FE-15078/1742 ..... N85-28454 #

DOE/JPL-1060-82 ..... N85-28445* #
DOE/JPL-1060-84 ..... N85-28447* #
DOE/JPL-1060-85 ..... N85-28449* #
DOE/JPL-956741-85/03 ..... N85-28461* #

DOE/MC-21129/T6 ..... N85-28501 #

DOE/NASA/0017-6 ..... N85-28109* #

DOE/NBM-5003237 ..... N85-28133 #
DOE/NBM-5007417 ..... N85-28452 #

DOE/OR-21400/T80 ..... N85-28889 #
DOE/OR-21400/T97-CH-4 ..... N85-28838 #

DOE/PC-30021/T16 ..... N85-28014 #
DOE/PC-51258/T1 ..... N85-28013 #
DOE/PC-70023/T1 ..... N85-28012 #

DOE/RL-02227/T2 ..... N85-28526 #

DOE/SAN-12197/2 ..... N85-28453 #

DOE/TIC-4584/R6 ..... N85-28881 #

DOR/ER-10874/4 ..... N85-28537 #

DOT/FAA/PM-85-03 ..... N85-28521 #

DP-MS-84-118 ..... N85-28469 #

DP-TR-78 ..... N85-28121 #

DPD-544-VOL-1 ..... N85-27924* #

DPST-84-907 ..... N85-28375 #

DRIC-BR-94189 ..... N85-28212 #

DRMA-05-VOL-1 ..... N85-27924* #

DTIC/TR-85/1 ..... N85-28878 #

D180-28285-1 ..... N85-28129 #

E-1935 ..... N85-27839* #
E-1999 ..... N85-28610* #
E-2316-1 ..... N85-28786* #
E-2482 ..... N85-28373* #
E-2535 ..... N85-28371* #
E-2554 ..... N85-27941* #
E-2556 ..... N85-28876* #
E-2582 ..... N85-28110* #
E-2585 ..... N85-28444* #
E-2596 ..... N85-28222* #
E-2603 ..... N85-27972* #
E-2606 ..... N85-27978* #
E-2612 ..... N85-27870* #
E-9597U ..... N85-28649 #

EDD-W-09514 ..... N85-28090 #

EDR-11442 ..... N85-28109* #

EGG-M-04085 ..... N85-28813 #
EGG-M-22784 ..... N85-28811 #

EGG-SE-6750-REV-1 ..... N85-28888 #

EGG/10282-4035 ..... N85-28255 #

EPA-230/04-84-006 ..... N85-28517* #
EPA-560/5-83-012-VOL-6-PT-1 ..... N85-28542 #

EPRI-EM-3836 ..... N85-28249 #

ESA-CR(P)-1964 ..... N85-28903 #
ESA-CR(P)-1974 ..... N85-28527 #
ESA-CR(P)-1978-VOL-1 ..... N85-27918 #
ESA-CR(P)-1978-VOL-2 ..... N85-27919 #
ESA-CR(P)-1987-VOL-1 ..... N85-27926 #
ESA-CR(P)-1987-VOL-2 ..... N85-27927 #
ESA-CR(P)-1990 ..... N85-28135 #
ESA-CR(P)-2002-VOL-1 ..... N85-27928 #

ESD-TR-84-276 ..... N85-28231 #
ESD-TR-84-284 ..... N85-28197 #
ESD-TR-84-287 ..... N85-28828 #
ESD-TR-84-293 ..... N85-28235 #
ESD-TR-84-294 ..... N85-28226 #
ESD-TR-85-148 ..... N85-28246 #

ESN-39-3 ..... N85-28717 #

ETL-0363 ..... N85-28624 #
ETL-0381 ..... N85-28627 #
ETL-0385 ..... N85-28672 #
ETL-0387 ..... N85-28654 #
ETL-0390 ..... N85-28439 #

FAA-APO-85-4 ..... N85-27863 #

FAA/DL-85-2 ..... N85-28199 #

FAA/PM-85-11 ..... N85-28516 #

FNAL-TM-1298 ..... N85-28635 #

FNAL/C-84/133-T ..... N85-28745 #
FNAL/C-85/15 ..... N85-28746 #

FSL-181 ..... N85-28802 #

FSU-STATISTICS-M692 ..... N85-28831 #

FTD-ID(RS)T-0543-84 ..... N85-28200 #
FTD-ID(RS)T-0563-84 ..... N85-28201 #
FTD-ID(RS)T-0667-84 ..... N85-28202 #
FTD-ID(RS)T-1440-84 ..... N85-28518 #
FTD-ID(RS)T-1548-84 ..... N85-28230 #

F80-10 ..... N85-27923* #

GA-A-17791 ..... N85-28427 #
GA-A-17888 ..... N85-28720 #

GKSS-84/E/53 ..... N85-28434 #

GS-CIRC-937 ..... N85-28476 #

HEDL-SA-3175-FP ..... N85-28094 #

HMI-B-353-VOL-3 ..... N85-28258 #

HOKE-84-AF-01 ..... N85-28267 #

HPP-84-4 ..... N85-28623 #

IAEA-CN-46/030 ..... N85-28015 #

IDA-M-9-VOL-1 ..... N85-28522 #

IDA/HQ-84-28971-VOL-1 ..... N85-28522 #

IFPR-13/1984 ..... N85-28104

IFSR-131 ..... N85-28803 #

IITRI-E06549-10 ..... N85-28209 #

INPE-3316-NTE/227 ..... N85-28613 #

IRI-190-81-05-REV ..... N85-28775 #
IRI-190-83-07 ..... N85-28774 #
IRI-190-83-12 ..... N85-28775 #

IS-M-536 ..... N85-28837 #

ISBN-0-947767-088 ..... N85-27826 #
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ISSN-0069-5882 ..... N85-28502 #
ISSN-0076-6755 ..... N85-28514 #
ISSN-0167-6580 ..... N85-28394 #
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ISSN-0169-1651 ..... N85-28532 #
ISSN-0169-1651 ..... N85-28533 #
ISSN-0170-1339 ..... N85-28217 #
ISSN-0171-1342 ..... N85-27833 #
ISSN-0171-1342 ..... N85-27837 #
ISSN-0171-1342 ..... N85-27836 #
ISSN-0171-1342 ..... N85-27862 #
ISSN-0171-1342 ..... N85-27861 #
ISSN-0171-1342 ..... N85-27920 #
ISSN-0171-1342 ..... N85-28215 #
ISSN-0171-1342 ..... N85-28285 #
ISSN-0171-1342 ..... N85-28336 #
ISSN-0171-1342 ..... N85-28442 #
ISSN-0171-1342 ..... N85-28471 #
ISSN-0171-1342 ..... N85-28472 #
ISSN-0171-1342 ..... N85-28558 #
ISSN-0171-7618 ..... N85-28561 #
ISSN-0173-699X ..... N85-28698 #
ISSN-0176-7739 ..... N85-27850 #
ISSN-0176-7739 ..... N85-27864 #
ISSN-0176-7739 ..... N85-27921 #
ISSN-0176-7739 ..... N85-28504 #
ISSN-0208-5658 ..... N85-28104
ISSN-0340-7608 ..... N85-27874 #
ISSN-0340-7608 ..... N85-28124 #
ISSN-0340-7608 ..... N85-28125 #
ISSN-0340-7608 ..... N85-28126 #
ISSN-0340-7608 ..... N85-28216 #
ISSN-0340-7608 ..... N85-28257 #
ISSN-0340-7608 ..... N85-28337 #
ISSN-0340-7608 ..... N85-28338 #
ISSN-0340-7608 ..... N85-28395 #
ISSN-0340-7608 ..... N85-28433 #
ISSN-0340-7608 ..... N85-28467 #
ISSN-0340-7608 ..... N85-28607 #
ISSN-0340-7608 ..... N85-28843 #
ISSN-0340-8922 ..... N85-28794* #
ISSN-0340-8922 ..... N85-28809 #
ISSN-0343-7639 ..... N85-28141 #
ISSN-0344-9629 ..... N85-28434 #
ISSN-0366-0885 ..... N85-28841 #
ISSN-0366-0885 ..... N85-28882 #
ISSN-0721-4529 ..... N85-28381 #

JAYCOR-J206-85-001/6242 ..... N85-28330 #

JF40026 ..... N85-28777 #

JOAP-TSC-84-01 ..... N85-27999 #
JOAP-TSC-84-01-APP ..... N85-28000 #

JPL-PUB-84-79-VOL-1 ..... N85-28887* #
JPL-PUB-84-94 ..... N85-28193* #
JPL-PUB-84-94-REV-1 ..... N85-28190* #
JPL-PUB-85-8 ..... N85-28445* #
JPL-PUB-85-11 ..... N85-28559* #
JPL-PUB-85-12 ..... N85-28191* #
JPL-PUB-85-14 ..... N85-28512* #
JPL-PUB-85-16 ..... N85-28446* #
JPL-PUB-85-18 ..... N85-28447* #
JPL-PUB-85-22 ..... N85-28529* #
JPL-PUB-85-23 ..... N85-28192* #
JPL-PUB-85-26 ..... N85-28448* #
JPL-PUB-85-32 ..... N85-28286* #
JPL-PUB-85-36 ..... N85-28449* #

JPL-503-573-VOL-1 ..... N85-28887* #
JPL-5105-147 ..... N85-28447* #
JPL-5105-150 ..... N85-28445* #
JPL-5105-159 ..... N85-28449* #
JPL-5210-22 ..... N85-28448* #
JPL-5230-15 ..... N85-28446* #
JPL-9950-1096 ..... N85-28475* #

JPRS-ESA-85-017 ..... N85-28177 #

JPRS-UEQ-85-004 ..... N85-28142 #

JPRS-UMM-84-014 ..... N85-28188 #

JPRS-UST-85-008 ..... N85-28872 #

JPRS-UTR-84-025 ..... N85-27841

JPRS-WST-84-024 ..... N85-28183 #

JUEL-SPEZ-288 ..... N85-28141 #

JUEL-1940 ..... N85-28682 #
JUEL-1962 ..... N85-28641 #

K/CSD-TM-53 ..... N85-28277 #

KNMI-WR-84-3 ..... N85-28531 #
KNMI-WR-84-4 ..... N85-28532 #
KNMI-WR-84-5 ..... N85-28533 #

K0387-6 ..... N85-28731 #

L-15901 ..... N85-27934* #
L-15923 ..... N85-27916* #
L-15924 ..... N85-27915* #
L-15927 ..... N85-27822* #
L-15992 ..... N85-28609* #
L-16003 ..... N85-28563* #

LA-UR-84-2003 ..... N85-28466 #
LA-UR-84-3927 ..... N85-28679 #
LA-UR-84-3928 ..... N85-28678 #
LA-UR-85-52 ..... N85-27925 #
LA-UR-85-151 ..... N85-28680 #
LA-UR-85-530 ..... N85-28902 #
LA-UR-85-639 ..... N85-28772 #
LA-UR-85-674 ..... N85-28347 #
LA-UR-85-675 ..... N85-28804 #
LA-UR-85-723 ..... N85-28807 #
LA-UR-85-734 ..... N85-28812 #

LA-10249 ..... N85-28684 #

LAIR-85-54 ..... N85-28534 #
LAIR-196 ..... N85-28541 #

LB-18255 ..... N85-28100 #

LBL-PUB-477 ..... N85-28869 #

LBL-18235 ..... N85-28767 #
LBL-18779 ..... N85-28744 #
LBL-18834 ..... N85-28773 #
LBL-18890 ..... N85-28098 #
LBL-18891 ..... N85-28097 #
LBL-18949 ..... N85-28752 #
LBL-19003 ..... N85-28248 #
LBL-19063 ..... N85-28764 #

LC-84-600241 ..... N85-28476 #

LIDS-P-1447 ..... N85-28391* #

LMSC-D877125 ..... N85-28893* #

LU8-36186QR1 ..... N85-28108* #

M-485 ..... N85-28708* #

MANPA-501(85) ..... N85-28128 #
MANPA-503(85) ..... N85-27973 #

MBB-Z-39/85-O ..... N85-28640 #

MBB/LFA33/CFK/PUB/007 ..... N85-27976
MBB/LFA34/CFK/PUB/006 ..... N85-27975
MBB/LFA34/CFK/PUB/008 ..... N85-27851

MIT-R84-2 ..... N85-28414 #

MIT/PFC-JA-84-43 ..... N85-28754 #

MITT-40 ..... N85-28502 #

MPA-83-01 ..... N85-28381 #

MPAE-W-79-84-46 ..... N85-28909 #

MPE-IR-41 ..... N85-28899 #

MPE-186 ..... N85-28897 #
MPE-189 ..... N85-28794* #

MPI-PAE/EXTRATERR-187 ..... N85-28898 #

MRL-R-960 ..... N85-28799 #

MTP-6-2-075 ..... N85-27846 #

MTR-84W-00179 ..... N85-28593* #
MTR-7610-VOL-7 ..... N85-27917 #

NAE-AN-26 ..... N85-27857 #
NAE-AN-27 ..... N85-27830 #
NAE-AN-28 ..... N85-27829 #

NAMRL-MONOGRAPH-31 ..... N85-28544 #

NAMRL-SR-85-3 ..... N85-28547 #

NAMRL-1311 ..... N85-28545 #

NAS 1.15:77629 ..... N85-27983* #
NAS 1.15:77651 ..... N85-27914* #
NAS 1.15:77654 ..... N85-27933* #
NAS 1.15:77821 ..... N85-27984* #
NAS 1.15:77838 ..... N85-28262* #
NAS 1.15:77845 ..... N85-27985* #
NAS 1.15:77846 ..... N85-28798* #
NAS 1.15:77864 ..... N85-28716* #
NAS 1.15:83556 ..... N85-27839* #
NAS 1.15:85009 ..... N85-28677* #
NAS 1.15:86366 ..... N85-27934* #
NAS 1.15:86378 ..... N85-27915* #
NAS 1.15:86383 ..... N85-27916* #
NAS 1.15:86418 ..... N85-27852* #
NAS 1.15:86431 ..... N85-27977* #
NAS 1.15:86505 ..... N85-28107* #
NAS 1.15:86506 ..... N85-27935* #
NAS 1.15:86687 ..... N85-27854* #
NAS 1.15:86699 ..... N85-28264* #
NAS 1.15:86713 ..... N85-27828* #
NAS 1.15:87012 ..... N85-28876* #
NAS 1.15:87026 ..... N85-28110* #
NAS 1.15:87029 ..... N85-28444* #
NAS 1.15:87038 ..... N85-28371* #
NAS 1.15:87040 ..... N85-28222* #
NAS 1.15:87043 ..... N85-27972* #
NAS 1.15:87044 ..... N85-28373* #
NAS 1.15:87045 ..... N85-27978* #
NAS 1.15:87049 ..... N85-27870* #
NAS 1.15:87064 ..... N85-28786* #
NAS 1.15:87472 ..... N85-28794* #
NAS 1.15:87478 ..... N85-28644* #
NAS 1.15:87479 ..... N85-28517* #
NAS 1.21:476 ..... N85-28562* #
NAS 1.26:3722 ..... N85-28893* #
NAS 1.26:3858 ..... N85-27930* #
NAS 1.26:3898 ..... N85-28511* #
NAS 1.26:132732-1 ..... N85-27855* #
NAS 1.26:132732-2 ..... N85-27856* #
NAS 1.26:165937 ..... N85-28611* #
NAS 1.26:166571 ..... N85-27843* #
NAS 1.26:171469 ..... N85-27940* #
NAS 1.26:171470 ..... N85-28263* #
NAS 1.26:171473 ..... N85-27923* #
NAS 1.26:171474 ..... N85-27924* #
NAS 1.26:171475 ..... N85-28108* #
NAS 1.26:171500 ..... N85-28221* #
NAS 1.26:171506 ..... N85-28642* #
NAS 1.26:172584 ..... N85-27824* #
NAS 1.26:172585 ..... N85-27825* #
NAS 1.26:172595 ..... N85-28513* #
NAS 1.26:174070 ..... N85-28608*
NAS 1.26:174715 ..... N85-28109* #
NAS 1.26:174747 ..... N85-28372* #
NAS 1.26:174916 ..... N85-27867* #
NAS 1.26:175489 ..... N85-28593* #
NAS 1.26:175770 ..... N85-28475* #
NAS 1.26:175791 ..... N85-28849* #
NAS 1.26:175840 ..... N85-28894 #
NAS 1.26:175841 ..... N85-28445* #
NAS 1.26:175856 ..... N85-28127* #
NAS 1.26:175859 ..... N85-28824* #
NAS 1.26:175870 ..... N85-28785* #
NAS 1.26:175871 ..... N85-28529* #
NAS 1.26:175872 ..... N85-28192* #
NAS 1.26:175873 ..... N85-28448* #
NAS 1.26:175874 ..... N85-28449* #
NAS 1.26:175875 ..... N85-28286* #
NAS 1.26:175876 ..... N85-28887* #
NAS 1.26:175877 ..... N85-28193* #
NAS 1.26:175878 ..... N85-28190* #
NAS 1.26:175879 ..... N85-28822* #
NAS 1.26:175880 ..... N85-28823* #
NAS 1.26:175881 ..... N85-27936* #
NAS 1.26:175882 ..... N85-28904* #
NAS 1.26:175883 ..... N85-28907* #
NAS 1.26:175885 ..... N85-27922* #
NAS 1.26:175886 ..... N85-28106* #
NAS 1.26:175887 ..... N85-28512* #
NAS 1.26:175888 ..... N85-28191* #
NAS 1.26:175889 ..... N85-28446* #
NAS 1.26:175890 ..... N85-28559* #
NAS 1.26:175892 ..... N85-28447* #
NAS 1.26:175893 ..... N85-28261* #
NAS 1.26:175894 ..... N85-28658* #
NAS 1.26:175897 ..... N85-28452 #
NAS 1.26:175898 ..... N85-28506* #
NAS 1.26:175899 ..... N85-28818* #
NAS 1.26:175901 ..... N85-27868* #
NAS 1.26:175908 ..... N85-28910* #

NAS 1.26:175909 ..... N85-28896* #
NAS 1.26:175910 ..... N85-28194* #
NAS 1.26:175915 ..... N85-28259* #
NAS 1.26:175917 ..... N85-28905* #
NAS 1.26:175919 ..... N85-28224* #
NAS 1.26:175920 ..... N85-28643* #
NAS 1.26:175921 ..... N85-28726* #
NAS 1.26:175922 ..... N85-28612* #
NAS 1.26:175953 ..... N85-28391* #
NAS 1.26:175959 ..... N85-28461* #
NAS 1.55:2377 ..... N85-28609* #
NAS 1.55:2379 ..... N85-28563* #
NAS 1.55:2381 ..... N85-27941* #
NAS 1.60:2422 ..... N85-28610* #
NAS 1.60:2434 ..... N85-27822* #
NAS 1.60:2469 ..... N85-28708* #
NAS 1.60:2485 ..... N85-27823* #
NAS 1.60:2486 ..... N85-28260* #
NAS 1.60:2489 ..... N85-28656* #

NASA-CP-2377 ..... N85-28609* #
NASA-CP-2379 ..... N85-28563* #
NASA-CP-2381 ..... N85-27941* #

NASA-CR-3722 ..... N85-28893* #
NASA-CR-3858 ..... N85-27930* #
NASA-CR-3898 ..... N85-28511* #
NASA-CR-132732-1 ..... N85-27855* #
NASA-CR-132732-2 ..... N85-27856* #
NASA-CR-165937 ..... N85-28611* #
NASA-CR-166571 ..... N85-27843* #
NASA-CR-171469 ..... N85-27940* #
NASA-CR-171470 ..... N85-28263* #
NASA-CR-171473 ..... N85-27923* #
NASA-CR-171474 ..... N85-27924* #
NASA-CR-171475 ..... N85-28108* #
NASA-CR-171500 ..... N85-28221* #
NASA-CR-171506 ..... N85-28642* #
NASA-CR-172584 ..... N85-27824* #
NASA-CR-172585 ..... N85-27825* #
NASA-CR-172595 ..... N85-28513* #
NASA-CR-174070 ..... N85-28608*
NASA-CR-174715 ..... N85-28109* #
NASA-CR-174747 ..... N85-28372* #
NASA-CR-174916 ..... N85-27867* #
NASA-CR-175489 ..... N85-28593* #
NASA-CR-175770 ..... N85-28475* #
NASA-CR-175791 ..... N85-28849* #
NASA-CR-175840 ..... N85-28894 #
NASA-CR-175841 ..... N85-28445* #
NASA-CR-175856 ..... N85-28127* #
NASA-CR-175859 ..... N85-28824* #
NASA-CR-175870 ..... N85-28785* #
NASA-CR-175871 ..... N85-28529* #
NASA-CR-175872 ..... N85-28192* #
NASA-CR-175873 ..... N85-28448* #
NASA-CR-175874 ..... N85-28449* #
NASA-CR-175875 ..... N85-28286* #
NASA-CR-175876 ..... N85-28887* #
NASA-CR-175877 ..... N85-28193* #
NASA-CR-175878 ..... N85-28190* #
NASA-CR-175879 ..... N85-28822* #
NASA-CR-175880 ..... N85-28823* #
NASA-CR-175881 ..... N85-27936* #
NASA-CR-175882 ..... N85-28904* #
NASA-CR-175883 ..... N85-28907* #
NASA-CR-175885 ..... N85-27922* #
NASA-CR-175886 ..... N85-28106* #
NASA-CR-175887 ..... N85-28512* #
NASA-CR-175888 ..... N85-28191* #
NASA-CR-175889 ..... N85-28446* #
NASA-CR-175890 ..... N85-28559* #
NASA-CR-175892 ..... N85-28447* #
NASA-CR-175893 ..... N85-28261* #
NASA-CR-175894 ..... N85-28658* #
NASA-CR-175897 ..... N85-28452 #
NASA-CR-175898 ..... N85-28506* #
NASA-CR-175899 ..... N85-28818* #
NASA-CR-175901 ..... N85-27868* #
NASA-CR-175908 ..... N85-28910* #
NASA-CR-175909 ..... N85-28896* #
NASA-CR-175910 ..... N85-28194* #
NASA-CR-175915 ..... N85-28259* #
NASA-CR-175917 ..... N85-28905* #
NASA-CR-175919 ..... N85-28224* #
NASA-CR-175920 ..... N85-28643* #
NASA-CR-175921 ..... N85-28726* #
NASA-CR-175922 ..... N85-28612* #
NASA-CR-175953 ..... N85-28391* #
NASA-CR-175959 ..... N85-28461* #

NASA-SP-476 ..... N85-28562* #

NASA-TM-77629 ..... N85-27983* #
NASA-TM-77651 ..... N85-27914* #
NASA-TM-77654 ..... N85-27933* #

NASA-TM-77821 ..... N85-27984* #
NASA-TM-77838 ..... N85-28262* #
NASA-TM-77845 ..... N85-27985* #
NASA-TM-77846 ..... N85-28798* #
NASA-TM-77864 ..... N85-28716* #
NASA-TM-83556 ..... N85-27839* #
NASA-TM-85009 ..... N85-28877* #
NASA-TM-86366 ..... N85-27934* #
NASA-TM-86378 ..... N85-27915* #
NASA-TM-86383 ..... N85-27916* #
NASA-TM-86418 ..... N85-27852* #
NASA-TM-86431 ..... N85-27977* #
NASA-TM-86505 ..... N85-28107* #
NASA-TM-86506 ..... N85-27935* #
NASA-TM-86687 ..... N85-27854* #
NASA-TM-86699 ..... N85-28264* #
NASA-TM-86713 ..... N85-27828* #
NASA-TM-87012 ..... N85-28876* #
NASA-TM-87026 ..... N85-28110* #
NASA-TM-87029 ..... N85-28444* #
NASA-TM-87038 ..... N85-28371* #
NASA-TM-87040 ..... N85-28222* #
NASA-TM-87043 ..... N85-27972* #
NASA-TM-87044 ..... N85-28373* #
NASA-TM-87045 ..... N85-27978* #
NASA-TM-87049 ..... N85-27870* #
NASA-TM-87064 ..... N85-28786* #
NASA-TM-87472 ..... N85-28794* #
NASA-TM-87478 ..... N85-28644* #
NASA-TM-87479 ..... N85-28517* #

NASA-TP-2422 ..... N85-28610* #
NASA-TP-2434 ..... N85-27822* #
NASA-TP-2469 ..... N85-28708* #
NASA-TP-2485 ..... N85-27823* #
NASA-TP-2486 ..... N85-28260* #
NASA-TP-2489 ..... N85-28656* #

NBDL-84R006 ..... N85-28543 #

NDRI-2655 ..... N85-28022 #

NEPRF-CR-84-10 ..... N85-28523 #
NEPRF-CR-84-11 ..... N85-28524 #

NIKHEF-H/84-16 ..... N85-28776 #

NLR-MP-83056-U ..... N85-28883 #
NLR-MP-84001-U ..... N85-28430 #
NLR-MP-84002-U ..... N85-28431 #
NLR-MP-84011-U ..... N85-28796 #
NLR-MP-84015-U ..... N85-28440 #
NLR-MP-84021-U ..... N85-27847 #
NLR-MP-84029-U ..... N85-27848 #

NLR-TR-83042-U ..... N85-27860 #

NMAB-415 ..... N85-28800 #

NOAA-DR-ERL-AOML-3 ..... N85-28528 #

NPRDC-TR-85-19 ..... N85-28670 #

NPS55-85-002 ..... N85-28423 #

NRC-24173 ..... N85-27857 #
NRC-24262 ..... N85-27830 #
NRC-24336 ..... N85-27829 #

NRCAA-TR-84-001 ..... N85-28329 #

NRL-MR-5540 ..... N85-28801 #

NRL-8671 ..... N85-28208 #

NSWC/TR-84-68 ..... N85-28005 #

NT-53/08-VOL-3 ..... N85-28258 #

NUSC-TR-7331 ..... N85-28232 #

NWC-TP-6499 ..... N85-28111 #
NWC-TP-6577 ..... N85-28325 #
NWC-TP-6591 ..... N85-28494 #
NWC-TP-6612 ..... N85-28450 #

ORNL-6102 ..... N85-28681 #
ORNL-6124 ..... N85-28662 #
ORNL-6125 ..... N85-28715 #

ORNL/EIS-163-VOL-6-PT-1 ..... N85-28542 #

ORNL/TM-9097 ..... N85-28352 #
ORNL/TM-9164 ..... N85-28816 #
ORNL/TM-9451 ..... N85-28335 #
ORNL/TM-9498 ..... N85-28457 #

PB85-163681 ..... N85-28528 #

PML-1984-C10 ..... N85-28024 #

PNL-SA-11886 ..... N85-28600 #
PNL-SA-12830 ..... N85-27974 #
PNL-SA-12865 ..... N85-28376 #
PNL-SA-12997 ..... N85-28351 #

PUBL-59 ..... N85-28900 #
PUBL-325 ..... N85-28470 #

QPR-3 ..... N85-28461* #

QR-3 ..... N85-28021 #

RADC-TOD-84-11 ..... N85-28851 #

RADC-TR-82-286-VOL-4F ..... N85-28242 #
RADC-TR-84-182 ..... N85-28245 #
RADC-TR-84-258 ..... N85-28596 #
RADC-TR-84-264 ..... N85-28851 #
RADC-TR-85-16 ..... N85-28243 #
RADC-TR-85-29 ..... N85-28597 #

RAE-TM-P-1026 ..... N85-28326 #

RAE-TM-SPACE-345 ..... N85-28901 #

RAND/P-7031 ..... N85-28662 #

RAND/R-3194-MIL ..... N85-28550 #

REPT-12 ..... N85-27996 #
REPT-15 ..... N85-27994 #
REPT-83-26 ..... N85-28688 #
REPT-84-01 ..... N85-28278 #
REPT-84-02 ..... N85-28670 #
REPT-84-03 ..... N85-28686 #
REPT-84-04 ..... N85-28428 #
REPT-84-07 ..... N85-28655 #
REPT-84-09 ..... N85-28279 #
REPT-84-15 ..... N85-28280 #
REPT-84-20 ..... N85-28687 #
REPT-84-23 ..... N85-27834 #
REPT-84-24 ..... N85-28711 #
REPT-84-29 ..... N85-28281 #
REPT-84-31 ..... N85-28282 #
REPT-84-33 ..... N85-28706 #
REPT-84-34 ..... N85-28283 #
REPT-84-35 ..... N85-28689 #
REPT-84-36 ..... N85-28636 #
REPT-84-37 ..... N85-28690 #
REPT-84-38 ..... N85-28637 #
REPT-84-39 ..... N85-28691 #
REPT-84-153 ..... N85-28817 #
REPT-252 ..... N85-28473
REPT-2006 ..... N85-28867 #
REPT-85140 ..... N85-27854* #
REPT-85160 ..... N85-28264* #
REPT-85209 ..... N85-27828* #
REPT-685101 ..... N85-28513* #

RFP-TRANS-448 ..... N85-28023 #

RSRE-MEMO-3696 ..... N85-28614 #
RSRE-MEMO-3765 ..... N85-28212 #

RX011-002/84-VOL-1 ..... N85-27928 #

R85-NRL-1 ..... N85-28203 #

S-REPT-99-91 ..... N85-28885 #

SAE-DC-85-R-004 ..... N85-28654 #

SAIC-85-/1621 ..... N85-28497 #

SAND-83-0583 ..... N85-28460 #
SAND-84-0470 ..... N85-28630 #
SAND-84-0941 ..... N85-28458 #
SAND-84-1423 ..... N85-28755 #
SAND-84-1852 ..... N85-28377 #
SAND-84-2080C ..... N85-28350 #
SAND-84-2090 ..... N85-28628 #
SAND-84-2420 ..... N85-28256 #
SAND-84-2564C ..... N85-28119 #
SAND-84-7002 ..... N85-28462 #
SAND-84-7004 ..... N85-28464 #
SAND-84-7020 ..... N85-28465 #
SAND-85-0387C ..... N85-28254 #
SAND-85-0401C ..... N85-28115 #
SAND-85-0538O ..... N85-28793 #

SAPR-20 ..... N85-28905* #
SAPR-21 ..... N85-28905* #

SC5305.6FR ..... N85-28835 #

SD-TR-85-05 ..... N85-28195 #
SD-TR-85-06 ..... N85-28492 #
SD-TR-85-07 ..... N85-28906 #
SD-TR-85-08 ..... N85-28789 #

SERI/SP-231-2405 ..... N85-28134 #
SERI/SP-271-2647 ..... N85-28451 #

SERI/TP-212-2576 ..... N85-28842 #
SERI/TP-252-2479 ..... N85-28019 #

SFCC-PUBL-11 ..... N85-28024 #

SMRC-DP-19 ..... N85-28854 #
SMRC-DP-20 ..... N85-28853 #
SMRC-DP-21 ..... N85-28852 #

SR-2 ..... N85-28274 #

SSD84-0055 ..... N85-27930* #

SU-SLAC-PUB-3415 ..... N85-28766 #
SU-SLAC-PUB-3496 ..... N85-28780 #
SU-SLAC-PUB-3510 ..... N85-28781 #
SU-SLAC-PUB-3527 ..... N85-28779 #
SU-SLAC-PUB-3528 ..... N85-28750 #
SU-SLAC-PUB-3535 ..... N85-28719 #
SU-SLAC-PUB-3536 ..... N85-28765 #
SU-SLAC-PUB-3547 ..... N85-28742 #
SU-SLAC-PUB-3550 ..... N85-28741 #
SU-SLAC-PUB-3552 ..... N85-28763 #
SU-SLAC-PUB-3577-PT-1 ..... N85-28603 #
SU-SLAC-PUB-3578-PT-2 ..... N85-28604 #
SU-SLAC-PUB-3665 ..... N85-28634 #

SU-SLAC-TN-85-1 ..... N85-28632 #

SU-STAN-CS-85-1037 ..... N85-28623 #

SU-STAN-LCS-9-PT-1 ..... N85-28603 #
SU-STAN-LCS-10-PT-2 ..... N85-28604 #

SU-TR-353 ..... N85-28704 #

SWRI-06-7668 ..... N85-28130 #

SYRU/DECE/TR-84/9 ..... N85-28210 #

T-3771 ..... N85-27843* #

TOP-6-2-075 ..... N85-27846 #

TPR-8 ..... N85-28501 #

TR-D-75-ARO ..... N85-28831 #

TR-ONR-7 ..... N85-28548 #
TR-ONR-8 ..... N85-28546 #

TR-2-ARO ..... N85-28677 #
TR-3 ..... N85-27995 #
TR-3-ONR ..... N85-28853 #
TR-5-ONR ..... N85-28854 #
TR-7-ONR ..... N85-28852 #
TR-8 ..... N85-28730 #
TR-02-85 ..... N85-28663 #
TR-03-85 ..... N85-28233 #
TR-11 ..... N85-28228 #
TR-12 ..... N85-27987 #
TR-13 ..... N85-27998 #
TR-13 ..... N85-28830 #
TR-14 ..... N85-28735 #
TR-16 ..... N85-28088 #
TR-16 ..... N85-28736 #
TR-17 ..... N85-28087 #
TR-17 ..... N85-28845 #
TR-18 ..... N85-28737 #
TR-26 ..... N85-28594 #
TR-31 ..... N85-28733 #
TR-34 ..... N85-27986 #
TR-37 ..... N85-28238 #
TR-38 ..... N85-28343 #
TR-39 ..... N85-28009 #
TR-53 ..... N85-28701 #
TR-84 ..... N85-28669 #
TR-85-1 ..... N85-28867 #
TR-85-01 ..... N85-28674 #
TR-86 ..... N85-28702 #
TR-88 ..... N85-28703 #
TR-89 ..... N85-28665 #
TR-90 ..... N85-28705 #
TR-91 ..... N85-28666 #
TR-135 ..... N85-28595 #
TR-171 ..... N85-28227 #

TR-679 ..... N85-28231 #
TR-0084A(5417-01)-1 ..... N85-28195 #
TR-0084A(5925-04)-1 ..... N85-28789 #
TR-0084A(5940-01)-1 ..... N85-28908 #
TR-0084A(5940-05)-2 ..... N85-28492 #
TR-1415 ..... N85-28619 #

TRI-PP-84-106 ..... N85-28756 #

TRW-42504-6001-UT-00 ..... N85-28138 #

TTU-CE-85 ..... N85-27940* #

TU-HH-TRI-ESA-84-2 ..... N85-28135 #

TVA/PE/EDT-85/5 ..... N85-28253 #

TWOPHASE/2 ..... N85-28453 #

U-OF-IOWA-83-7 ..... N85-28496 #

UCID-20303 ..... N85-28251 #
UCID-20305 ..... N85-28601 #
UCID-20323 ..... N85-28349 #
UCID-20371 ..... N85-28631 #

UCRL-TRANS-12049 ..... N85-28252 #
UCRL-TRANS-12050 ..... N85-28250 #
UCRL-TRANS-12051 ..... N85-28247 #

UCRL-52000-84-11 ..... N85-28868 #
UCRL-53536 ..... N85-28456 #
UCRL-90750 ..... N85-28334 #
UCRL-91333 ..... N85-28767 #
UCRL-91786-REV-1 ..... N85-28683 #
UCRL-91795 ..... N85-28839 #
UCRL-91803 ..... N85-28010 #
UCRL-92201 ..... N85-28808 #
UCRL-92210 ..... N85-28392 #

UMD-DMSS-85-4 ..... N85-28699 #
UMD-DMSS-85-5 ..... N85-28700 #

UNC/ORSA/TR-84/15 ..... N85-28710 #

UROCHESTER/DC/82/TR-60 ..... N85-28344 #

US-PATENT-APPL-SN-256880 ..... N85-27866
US-PATENT-APPL-SN-434671 ..... N85-28784
US-PATENT-APPL-SN-442494 ..... N85-28505
US-PATENT-APPL-SN-477793 ..... N85-28096
US-PATENT-APPL-SN-484327 ..... N85-28339
US-PATENT-APPL-SN-496336 ..... N85-28220
US-PATENT-APPL-SN-564547 ..... N85-28219
US-PATENT-APPL-SN-566444 ..... N85-28443
US-PATENT-APPL-SN-578304 ..... N85-27865
US-PATENT-APPL-SN-586053 ..... N85-28218
US-PATENT-APPL-SN-615507 ..... N85-28105
US-PATENT-APPL-SN-679332 ..... N85-28225 #
US-PATENT-APPL-SN-696679 ..... N85-28599 #
US-PATENT-APPL-SN-698726 ..... N85-28333 #
US-PATENT-APPL-SN-698957 ..... N85-28273 #
US-PATENT-APPL-SN-698963 ..... N85-28560 #
US-PATENT-APPL-SN-704109 ..... N85-28791 #
US-PATENT-APPL-SN-705816 ..... N85-28836 #
US-PATENT-APPL-SN-705827 ..... N85-28213 #
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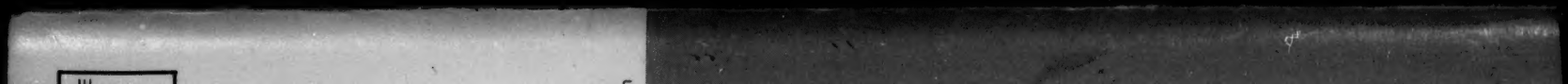
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